DISEASE MANAGEMENT EVALUATION

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Report of Disease Management Evaluation

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Executive Summary

Faculty from the University of WA Schools of Medicine and Public Health conducted an evaluation of Disease Management programs for End Stage Renal Disease (ESRD), Asthma, Congestive Heart Failure (CHF), and Diabetes. We used a variety of data sources in evaluating the effects that enrollment in these programs had on outcomes for the Medicaid population including: claims and encounter data provided by DSHS, chart data abstracted by OMPRO, and administrative data on patient and provider contact provided by the contracted vendors (Renaissance and McKesson). We attempted to statistically control for the fact that patients were not randomly assigned to receive disease management. We further conducted several different analyses for each condition. The results are briefly summarized below

Condition	Vendor	Outcomes Evaluated	Findings
ESRD	Renaissance	Laboratory values ED visits Hospitalizations Length of Stay (LOS)	High degree of patient contact is associated with improved lab values. ED visits and Hospitalizations decreased by 33 and 40% respectively. LOS decreased by 7 days.
Asthma	McKesson	Written Care Plan in chart ED visits Hospitalizations Length of Stay	DM patients more than twice as likely to have written care plans. No effect was noted on ED visits, Hospitalizations, or LOS for all patients. However, LOS decreased by a little more than one day for high risk and high cost patients who were hospitalized.
CHF	McKesson	ED visits Hospitalizations Length of Stay	No significant benefits of DM discerned for all outcomes
Diabetes	McKesson	ED visits Hospitalizations Length of Stay HgA1c checks Retinal examination	No differences in rates of ED visits or hospitalizations. LOS was ¼ day less for DM patients. DM patients more than twice as likely to have a HgA1c test performed and 1.5 times as likely to have a retinal exam.

In summary, Disease Management of chronically ill patients is associated with improved some aspects of care for patients with ESRD, Asthma, and Diabetes. We detected no benefit for patients with CHF. Two critical questions remain. First, would a more robust assessment (i.e. a prospective randomized trial) confirm these findings? Second, are these improvements (if causally related to DM) cost-effective from the perspective of DSHS.

Introduction

What follows represents the UW Child Health Institute's assessment of the Renaissance Disease Management program for end stage renal disease (ESRD) patients and McKesson's Disease Management (DM) program for asthma, diabetes, and congestive heart failure (CHF) patients in WA State.

Our evaluations were hampered in several ways. Patients were not randomized to disease management, so patients who were enrolled in disease management are likely to be very different from patients who were not enrolled in disease management. We have no control population in the evaluation of ESRD disease management program since all patients with end stage renal disease received some amount of active disease management during the evaluation period. Ideally, we would like to have compared outcomes among patients with disease management to a population of similar patients without it over a concomitant period of time. Moreover, all ESRD patients were enrolled in dialysis concomitantly with disease management making disaggregation of the independent effects of dialysis versus disease management challenging. In our evaluation of the asthma, diabetes and CHF disease management programs there were patients who were not actively enrolled in the programs. It may be that the patients identified by McKesson to receive disease management are not representative of the entire eligible population of patients with asthma, CHF and diabetes, so the effect of disease management on outcomes is generalizable to patients similar to those included in this analysis. Finally, there was limited data available to control for patient differences, so the effect of disease management on outcomes observed in our samples is likely to be biased.

Renaissance ESRD Disease Management

We conducted two separate analyses: one concurrent and one with historical controls. The concurrent analyses used patients enrolled in disease management during the evaluation period. Given the limitations of the data, we have endeavored to determine if the amount of contact with Renaissance was associated with improved outcomes during the evaluation period. Put another way, we have decided to use "*exposure"* to disease management as our predictor variable. Some limitations with this approach should be stated at the outset. First, it is possible that patients with more contact differ in some underlying way from those with less contact. In particular, they may be sicker and require more contact—a bias which would make contact appears less effective (or perhaps even detrimental). However, it is also possible that patients with more contact are more prone to improved outcomes than those with less contact. For example, they may be more responsible, available, or invested in improving their health. Unfortunately, these biases would skew the results in two opposite directions (one to make the program appear less effective the other to make it appear more so). We have no way of controlling for them or knowing a priori if they exist or what the magnitude of their effects might be.

The historical control analysis used patients enrolled in Medicaid during the period Jan 1, 2001- Dec 31, 2001 who had a diagnosis of ESRD which we defined as follows: any patient who began chronic outpatient dialysis that cost at least $2000/month. Outpatient dialysis was defined by revenue and CPT codes. Furthermore, identified months of chronic dialysis had to occur during months the patients met specified eligibility criteria. This approach for identifying patients was discussed with Renaissance. Notably, we identified patients that were different from their own, internal analyses. However, our results were consistent with theirs.

Data Sources
For our evaluations, we attempted to use data from four sources

1) Medicaid claims and encounter data (provided by DSHS)
2) Laboratory data on ESRD patients (provided by Renaissance)
3) Data on disease management contacts and patient acuity from Renaissance.
4) Satisfaction data (provided by Renaissance)

McKesson Asthma, CHF, and Diabetes Disease Management

We conducted concurrent analyses that used patients actively enrolled in disease management during the evaluation period and compared them to the patients who weren't actively enrolled the program. It is important to note that patients in the control group and their providers were still receiving education and support materials by mail. The actively enrolled patients were engaged in phone calls and face to face meetings with care managers, in addition to receiving mailed materials. Thus our control group is not entirely disease management-free, in that, they are exposed to the effects mailed care materials. This could bias the estimates toward the null if mailed materials have a measurable impact on patients' care. We endeavored to determine if being actively disease managed was associated with improved outcomes during the evaluation period. Put another way, we have decided to use "*exposure"* to disease management as our predictor variable. Our evaluation period was defined by the activity data we had from July 2002 through October 2003. This is a shorter time than previous cost analyses that evaluate the program over a 24 month period. It is conceivable that the effects of disease management are not immediately observable therefore a longer evaluation period would be beneficial. However, the cost analyses followed a pre-post format which requires a pre intervention time that is equal to the post intervention time. Our concurrent analyses require only the post intervention period and a 16 month intervention period ought to be adequate, considering the 12 month post intervention period in the cost analyses.

Data Sources
For our evaluation, we attempted to use data from three sources

1) Medicaid claims and encounter data (provided by DSHS)
2) Abstracted chart data for laboratory and written care plan for patients (provided by OMPRO)
3) Data on disease management activity and patient characteristics from McKesson.

Methods

<u>ESRD</u> (Concurrent control analyses)

We conducted analyses using both the Medicaid claim data and the laboratory data from Renaissance. Unfortunately, there were so few patients surveyed (n=25) that the satisfaction data were not worth analyzing.

I. Laboratory Analysis

This analysis uses lab data provided by Renaissance.

We received data on 214 patients with end stage renal disease from Renaissance who were enrolled in the Disease Management Program sometime between April 2002 to

Oct 2003. Of these, there were 184 patients with both lab and encounter data. For these patients there were 907 encounters.

The laboratory values used as outcomes had been discussed prior to our evaluation by members of the team including representatives from UW and DSHS, as well as Renaissance. Generally accepted quality indicators for patients with ESRD are improvement in specific laboratory values that can be achieved through the appropriate timely use of dialysis as well as medication and lifestyle. The laboratory values for patients in our sample were obtained as part of Renaissance case management and forwarded to UW. We employed the generally accepted levels for each test as detailed in Table 1.

Table 1: List of ESRD laboratory tests and normal ranges

Laboratory Test	Normal Range
ALBUMIN SERUM (ALB)	≥3.5
CALCIUM x PHOSPHORUS PRODUCT (CAPO4)	<70.0
HEMOGLOBIN (HGB)	11.0-12.9
HEMOGLOBIN A1C (HGBa1C)	≤7
KT/V DELIVERED	≥1.2
UREA REDUCTION RATIO (URR)	≥65

Outcome/Quality variables

We endeavored to determine a method for evaluating whether or not patients had improved as a result of enrollment on the Renaissance program. We used laboratory data from two time periods in making our assessment, specifically, for each type of lab test, we averaged patients' lab values for an initial period over the first 3 ("pre") and last 3 ("post") months for which we had lab test data. Outcome variables were defined based on test values determined as "pre" or "post" disease management. We then compared these averages with the ranges in Table 1, above, to determine whether they were in the normal or abnormal range. To enhance our statistical power, we evaluated all of the laboratory tests together. Our analysis therefore seeks to answer the global and generic question: **Do laboratory values for ESRD patients *generally* improve during disease management?**

From the beginning of the evaluation to the end, patients could follow one of three trajectories: (1) They could get better, (2) They could get worse, (3) They could remain the same. These trajectories are important because they impose some endogenous constraints for the disease management team. Patients who are doing well at baseline (i.e. have normal laboratory values) cannot get better. For them, high quality care would entail maintaining normal values during the course of the year (i.e. remaining the same).

We analyzed these changes in two ways. In our first analysis, (All Labs), we looked at **all lab results** and credited disease management with good quality care if a) an average test value went from "abnormal" in the "pre" period to normal in the post period, or b) normal laboratory tests remained normal. In this analysis, poor quality was defined if a) an average test value went from "normal" in the "pre" period to "abnormal" in the post period, or b) if abnormal results remained abnormal.

In a second, sub analysis, (Status Change) we focused only on laboratory tests where the status changed during the period of disease management (viz. changed from

normal to abnormal or abnormal to normal). In this analysis, disease management could also be associated with improved or worsened quality of care.

Accordingly, we developed the following methodology for determining quality of care for each laboratory value.

Table 2: Outcomes for disease management evaluation

Lab test results		Quality	
PRE	**POST**	**All Labs (N=907)**	**Status Change (N=174)**
Abnormal→	Normal	Good	Good
Normal→	Normal	Good	N/A
Abnormal→	Abnormal	Poor	N/A
Normal→	Abnormal	Poor	Poor

Exposure

We identified 3 different types of contact between Renaissance and patients: contacts with patients, contacts with providers, and contacts for set-up/administrative purposes. In addition, some encounters were face to face and others were not. Face to face encounters are more resource intensive but also may be more efficacious and so we conducted separate analyses assessing their relationship with quality outcomes. We also combined all types of encounters to evaluate the effect of encounters generally. Table 3 below summarizes the types of encounters that occurred during the evaluation period

Table 3: Summary of types of contacts during evaluation period

Encounter Type	Mean # contacts per client (SD)	Median	Range
Total	60.25 (39.2)	51	0-163
Administrative	3.65 (1.89)	3	0-10
Patient	23.67 (15.75)	21	0-66
Provider	32.9 (27.75)	22	0-105
Face to Face	34.7 (28.81)	24	0-113

Other Covariates

We controlled for baseline status (normal vs abnormal test).

Statistical Analysis

We used logistic regression to determine whether good quality of care was achieved, controlling for baseline laboratory status as well as type of visit and number of each kind of visits. To simplify interpreting the results, we divided patients into thirds based on the amounts (high, medium, or low) of each of these three kinds of contacts.

II. Medicaid claim Analysis

In this analysis, we used Medicaid Claim data to evaluate the potential effects of Disease Management encounters on hospitalizations and Emergency Department visits for Patients with ESRD. We attempted to determine, using a "before-after" approach, if the number of hospital days and emergency department visits decreased after patients enrolled in disease management.

To evaluate the effect of disease management encounters on the number of hospital days we investigated the inpatient Medicaid claims for the DM ESRD patients. Of 184, we linked 159 patients to claims from Jan 2000 to Dec 2003. Since each patient began and finished the study at different times we created individualized matched pre-and post-intervention intervals for comparison of utilization. The shortest span of the first and last claim available, relative to the start date, determined the pre and post intervals. For example, if a patient's first claim was 8 months prior and last claim was 6 months after the date they enrolled in the study then the intervals we examined were 6 months before and after the study start date. We limited the length of the intervals to be 1 month to no more than 1 yr. Hospital days were calculated as the number of days between the first and last service dates. The number of hospital days was then summed over all the claims that occurred in the pre and post intervals. Change was calculated as the difference between the post and pre number of hospital days. We then used logistic regression to evaluate the outcome of any decrease in the number of hospital days for 52 patients. The encounter types were modeled continuously.

A similar analysis was done where the outcome was any decrease in the number of ED visits. Claims for 82 ESRD patients were included in this analysis.

For the hospital day analysis, we determined for each patient if the number of days that they were hospitalized during the disease management period decreased compared to the pre-disease management period. Each individual therefore either spent fewer days in the hospital prior to the disease management or they did not. This analysis was only performed for patients for whom there was a claim for hospitalized care in the year PRIOR to their involvement with disease management. The ED visitation analysis was completely analogous. That is, we determined for each patient that had an ED visit in the year prior to DM if they had fewer ED visits in an equivalent period of time during DM.

We then performed logistic regression analyses to determine if exposure to different components of DM was associated with decreased ED usage and hospital days. These results follow.

In this analysis, we again used Medicaid Claim data to evaluate the potential effects of Disease Management on hospitalizations and Emergency Department visits for Patients with ESRD. However, we created a historical control group by choosing eligible ESRD patients during the year preceding DM to compare to the ESRD patients enrolled in DM during June 2002 through May 2003. We calculated months of exposure as the time in the DM program for the 2002-3 ESRD patients and number of months on chronic dialysis for the 2001 ESRD patients. We then used Poisson regression to evaluate the count outcomes of hospitalizations (103 Pre DM and 19 Post DM patients) and ED visits (94 Pre DM and 31 Post DM patients). Logistic regression models were used to analyze the number of hospital days (103 Pre DM and 19 Post DM patients). All models were clustered by person to account for within person variance.

Other Covariates

We controlled for as many demographic characteristics of patients as we could to minimize the bias caused by systematic differences between patients receiving disease

management and patients not receiving disease management. The demographic characteristics controlled were baseline status (normal vs abnormal test), age, gender and race (Caucasian, other).

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ESRD (Historical control analyses)

I. Medicaid Claim Analysis

In this analysis, we again used Medicaid Claim data to evaluate the potential effects of Disease Management on hospitalizations and Emergency Department visits for Patients with ESRD. However, we created a historical control group by choosing eligible ESRD patients during the year preceding DM to compare to the ESRD patients enrolled in DM during June 2002 through May 2003. We calculated months of exposure as the time in the DM program for the 2002-3 ESRD patients and number of months on chronic dialysis for the 2001 ESRD patients. We then used Poisson regression to evaluate the count outcomes of hospitalizations (103 Pre DM and 19 Post DM patients) and ED visits (94 Pre DM and 31 Post DM patients). Logistic regression models were used to analyze the number of hospital days (103 Pre DM and 19 Post DM patients). All models were clustered by person to account for within person variance.

Asthma, CHF, Diabetes (Concurrent control analyses)

We conducted analyses using Medicaid claims data for asthma, CHF and diabetes. We used laboratory data for analyses of a subset of the diabetes sample. Written care plan data abstracted from charts was used for analyses of a subset of the asthma sample.

Exposure

We defined asthma patients 'exposed' to disease management if they had completed an initial assessment and had at least one month of an 'active' status during the program period.

Conversely, patients were classified as unexposed if they did not complete an initial assessment and had no 'active' months during the same program period. An initial assessment was completed either at the time of recruitment on the phone or was scheduled for another phone call shortly thereafter.

Furthermore, to control for time we defined a 'months of observation' variable. For the 'exposed' group the clock begins at the first month of an active status and ends either with death or October 31 2003, whichever comes first. Likewise, for the 'unexposed' group, the clock begins at the first month we have a non-missing status and ends either with death or October 31 2003, again whichever comes first.

We also controlled for the fact that an exposed patient could have some interruption during their disease management. That is, there are some cases where a patient is active and then later loses the activity status for a time and then regains it

before the end of the program period. We created a flag for any gap in activity to control for an interruption in disease management. There were <2% who had any gap in activity.

Other Covariates

We controlled for as many demographic characteristics of patients as we could to minimize the bias caused by systematic differences between patients receiving disease management and patients not receiving disease management. The demographic characteristics controlled were age, gender and race (Caucasian, African-American, Asian-American and other). Finally, we controlled for whether a patient's costs were in the top 25% or top 15% of costs in the sample at baseline.

Statistical Analysis

ALL SAMPLES

We conducted analysis of health care utilization in the asthma, CHF and diabetes samples. The asthma sample included patients aged 2 and older. The CHF and diabetes samples included patients aged 18 and older. In each sample, we counted the number of hospitalizations and emergency department (ED) visits the patient had during their months of observation. Likewise, we summed all the days spent in the hospital during the months of observation for the length of stay analysis.

Since hospitalizations and ED visits are count data with non-normal distributions, we performed Poisson regression analyses to determine if exposure to DM was associated with the number of hospitalizations and ED visits. A fairly low percentage of all patients had hospitalizations and ED visits. We ran ordinary least squares linear regression to analyze length of stay on all patients. Cluster correction for repeated measures on patients was included in all models.

As a sub-analysis in utilization, we also stratified our analyses by those who were in high risk and those in high cost to assess whether disease management has a different impact for different groups of people.

ASTHMA OUTCOMES AND SUBANALYSIS

For the 215 asthma patients with a written care plan data and who were over one year of age, we conducted a sub-analysis to determine whether a written care plan was achieved. We estimated a logistic regression model controlling for months of observation, gap in activity, age, sex, race, activity in diabetes disease management program, activity in CHF disease management.

DIABETES OUTCOMES ANALYSIS

For diabetes patients, we estimated the effect of disease management on having one or more HGBa1c tests. This analysis was estimated using a logistic regression. We also used Poisson regression to model the number of Hba1c tests that each patient received, which are count data similar to the number of hospitalizations or ED visits. This model adjusted for repeated measures of patients. Finally, we used logistic regression to model having any retinal exam. We also stratified our analyses by those

who were in high risk and those in high cost to assess whether disease management has a different impact for different groups of people.

For the 128 diabetes patients with HbA1c values, we estimated the effect of disease management on whether a normal HGBa1c was achieved. A logistic regression was run that controlled for months of observation, gap in activity, age, sex, race, activity in diabetes disease management program, activity in CHF disease management. We further restricted our analyses to patients who were at least 18 years old.

SENSITIVITY ANALYSES

Sensitivity analyses on health care utilization were examined to assess whether models that were run on the entire sample (e.g., including patients with no utilization) would generate different results. Results are presented in the Appendix. That is, the large proportion of patients with no utilization could dampen the measurable effects of DM. We used a two-part approach to account for the over-representation of zero counts. First, an initial model was run for whether each person has any ED visits/ hospitalizations versus none. The outcome of any hospital length was the same as any hospitalizations so logistic models for the outcome of any length of stay versus none were not done. Then, we ran a Poisson or linear model on number of ED visits/ hospitalizations/length of stay restricting to patients who have some utilization.

Since there are groups of patients who have co-morbidities and are actively enrolled in multiple disease management programs. We further ran our main and sensitivity models after excluding any patient who was actively enrolled in any of the other two programs.

We also investigated how intensity of disease management affected the utilization outcomes. We defined three levels of disease management; low, medium, and high, based on tertiles of therapeutic calls. We then separated the treated group into low medium and highly managed groups and compared each group to the untreated patients.

Results

ESRD

I. laboratory analyses (concurrent control analyses):

Table 4: Demographics of ESRD patients (Lab analysis) N=184

	% or mean (range)
Gender Male	47
Age (yrs)	54.3 (16-87)
Risk Low: acuity 0-2 High: acuity 3-5	 137 (74.5) 47 (25.5)
Months in study	10.9 (1-18)

In general, in the adjusted models, high degrees of patient contact and face to fact contact were associated with improved laboratory values as well as with positive changes in laboratory values. Increased provider contact appeared to be associated with decreased probability of quality outcomes for both analyses. Face to face contact in particular was associated with an increased probability of high quality care. These results are shown in Table 5. Given our small sample size, few results reached statistical significance. Those that did are shown in bold.

Table 5: Logistic regression of encounter types and lab test outcomes

Type of encounter	Analysis			
	All Patients		Status Change	
	OR (95% C.I.)[1]	Fully Adjusted OR (95% C.I.)[2]	OR (95% C.I.)[3]	Fully Adjusted OR (95% C.I.)[3,4]
Face-to-face				
Low	1.00	1.00	1.00	1.00
Medium	1.05 (0.73-1.50)	1.32 (0.86-2.04)	0.97 (0.49-1.91)	1.53 (0.62-3.80)
High	1.25 (0.91-1.71)	1.82 (0.96-3.43)	1.81 (0.84-3.88)	**6.54 (1.61-26.63)**
Patient				
Low	1.00	1.00	1.00	1.00
Medium	1.19 (0.84-1.68)	1.14 (0.81-1.61)	1.11 (0.54-2.28)	0.71 (0.31-1.62)
High	**1.47 (1.05-2.05)**	1.42 (0.89-2.27)	**2.41 (1.17-4.95)**	1.54 (0.66-3.59)
Provider				
Low	1.00	1.00	1.00	1.00
Medium	0.81 (0.59-1.12)	**0.57 (0.37-0.89)**	0.84 (0.42-1.66)	0.43 (0.18-1.07)
High	0.91 (0.64-1.29)	**0.45 (0.24-0.85)**	0.89 (0.41-1.94)	**0.15 (0.04-0.58)**
Set-up/admin				
Low	1.00	1.00	1.00	1.00
Medium	1.14 (0.81-1.61)	1.17 (0.83-1.64)	1.46 (0.70-3.04)	1.49 (0.69-3.21)
High	0.80 (0.57-1.13)	0.79 (0.55-1.13)	0.81 (0.40-1.65)	0.74 (0.34-1.61)

[1] Model controls for baseline status

[2] Model controls for baseline status, face-to-face, patient, provider and set-up/admin encounters

[3] Model does not control for baseline status because it perfectly predicts improve vs worse

[4] Model controls for face-to-face, patient, provider and set-up/admin encounters

II. Medicaid claim analyses (concurrent control analyses):

Table 6: Demographic Data on Patients in Hospital days and ED visit analysis

	Mean, median (range)
Pre/post time interval (days)	311.2, 365 (3-365)
Pre interval	
All claims	426.1, 356 (0-1292)
Hospital days, n=52	19.6, 12.5 (2-145)
ED visits, n=82	5.1, 3 (1-33)
Post interval	
All claims	396.9, 380 (1-1306)
Hospital days	18.8, 11 (2-115)
ED visits	5.8, 3.5 (1-28)
Any decrease in	
Hospital Days	54%
ED visits	33%

The below results fail to show any significant differences in hospital days or ED visits before and after patients entered into disease management (Tables 7 and 8). This is consistent with what was shown in the unadjusted data in Table 6.

Table 7: Logistic regression of encounter types and any decrease in number of hospital days, n=52

Type of encounter	Any decrease in the number of hospital days			
	OR (95% C.I.)[1]	P-value	OR (95% C.I.)[2]	P-value
Face-to-face	1.00 (0.97-1.03)	0.87	0.98 (0.91-1.06)	0.65
Patient	1.01 (0.95-1.07)	0.77	1.00 (0.94-1.07)	0.99
Provider	1.00 (0.97-1.03)	0.96	1.04 (0.94-1.13)	0.47
Set-up/admin	0.74 (0.50-1.10)	0.14	0.71 (0.47-1.09)	0.12
All types combined	1.00 (0.98-1.02)	0.98	---	---
Face-to-face/patient	1.00 (0.93-1.07)	0.95	0.99 (0.90-1.09)	0.85
Face-to-face/provider	1.00 (0.96-1.05)	0.88	1.00 (0.95-1.07)	0.74

Table 8: Logistic regression of encounter types and any decrease in number of ED visits, n=83

Type of encounter	Any decrease in the number of ED visits			
	OR (95% C.I.)[1]	P-value	OR (95% C.I.)[2]	P-value
Face-to-face	1.00 (0.98-1.02)	0.92	1.03 (0.97-1.09)	0.33
Patient	0.98 (0.94-1.03)	0.40	0.96 (0.89-1.03)	0.22
Provider	1.00 (0.98-1.02)	0.84	0.99 (0.94-1.03)	0.53
Set-up/admin	1.18 (0.85-1.63)	0.33	1.20 (0.84-1.70)	0.31
All types combined	1.00 (0.98-1.01)	0.65	---	---
Face-to-face/patient	1.00 (0.96-1.04)	0.91	0.99 (0.94-1.05)	0.82
Face-to-face/provider	1.00 (0.96-1.03)	0.88	1.00 (0.96-1.04)	0.95

[1] Model controls for baseline status (normal test vs not normal), months (log-transformed) in program, age (yrs), sex (male vs female), and race (African American, Hispanic, other vs. white) risk (acuity: 3-5 vs 0-2)

[2] Controls for same as model 1 as well as face-to-face, patient, provider and set-up/admin encounters

Models for face-to-face/patient and /provider do not control for set-up/admin encounters.

We next tried to determine if disease management worked better for some patients than for others. One could imagine that patients with lower acuity could be better served than those with high acuity since a little assistance might go farther with patients that are not that ill. Alternatively, one might imagine that disease management works better for patients with high acuity given the increased burden of their disease. In epidemiological terms, this is called effect modification. That is, the effect of the exposure is modified by some underlying characteristic. We were unable to formally assess this possibility with stratified analyses of patients identified by Renaissance at baseline to be low or high acuity because of small sample sizes.

IV. Medicaid claim analyses (historical control analyses):

Table 9: Utilization analysis for pre DM ESRD patients (1-12/2001) vs post DM ESRD (6/2002-5/2003)

	Pre Disease Management N=190	Post Disease Management N=147
Months of exposure		
Mean, median (range)	7.6, 8 (1-12)	9.7, 12 (1-12)
Hospitalizations		
N	103	19
Mean, median (range)	2.0, 1 (1-10)	1.1, 1 (1-2)
Hospital days		
N	103	19
Mean, median (range)	14.8, 8 (1-95)	6.5, 3 (1-20)
ED visits		
N	94	31
Mean, median (range)	2.1, 1 (1-18)	1.4, 1 (1-5)

The historical control analyses suggest a strong protective effect the ESRD Disease Management program and utilization, (Table 10). The post-DM group of ESRD patients was significantly less likely to have ED visits and hospitalizations than the pre-DM group. Furthermore, those in the post-DM groups were more likely to have a shorter stay, by 1 week, once they were hospitalized. Significant results are shown in bold.

Table 10: Regression analyses of ESRD DM, hospitalizations, length of stay and ED visits

Outcome	**RR (95% C.I.)[1]**	**P-value**
ED visits	**0.67 (0.49-0.91)**	**0.01**
Hospitalizations	**0.58 (0.47-0.72)**	**<0.001**
	Coef (95% C.I.)[2]	**P-value**
Length of stay (days)	**-7.07 (-11.34-(-2.81))**	**0.001**

[1] Poisson regression models control for months (log-transformed) in program (post-DM) or months of chronic dialysis (pre-DM), age (yrs), sex (male vs female), race (Asian, other vs. white), clustered by patient.
[2] Linear regression model controls for months (log-transformed) in program (post-DM) or months of chronic dialysis (pre-DM), age (yrs), sex (male vs female), race (Asian, other vs. white), clustered by patient.

Asthma

I. Written care plan (concurrent control analyses):

This analysis uses chart data provided by OMPRO.

We chose a random sample of asthma patients of each of three groups who differed in their level of disease management. We sent a list 363 asthma patients who were either high cost or high risk and we had activity data for sometime during the disease management period of July 2002 to October 2003. We received written care plan data for 215 asthma patients in the Disease Management Program sometime between April 2002 to Oct 2003. Basic descriptive data on the patients are presented in Table 11.

Outcome/Quality variables
We used the presence (yes vs no) of a written care plan in the chart as the outcome.

We excluded patients from the analysis if
1) we could not assign an exposure group due to missing data (n=34)
2) completed the initial assessment before July 2002 (n=4)

After exclusions, there 177 asthma patients included in the analyses.

Table 11: Demographics of asthma patients written care plan analysis

	Actively Disease Managed Patients N=117	Not Actively Disease Managed Patients N=60
Covariates		
Months of observation		
Mean, median	12.7, 14	13.2, 15
(Range)	(6-16)	(6-16)
Race – N (%)		
White	88 (75.2)	40 (66.7)
Other	29 (24.8)	20 (33.3)
Age – years		
Mean, median	36.8, 42	33.5, 39
(Range)	(1-73)	(1-62)
Gender – N (%)		
Male	37 (31.6)	18 (30.0)
Female		
Active in other DM programs– N (%)		
Diabetes	8 (6.8)	0 (0.0)
CHF	3 (2.6)	0 (0.0)
Outcome		
Written care plan	44 (37.6)	15 (25.0)

Enrollment in asthma disease management was significantly associated with having a written care plan, (Table 12). Asthma patients actively enrolled in DM were about 2.5 times more likely to have a care plan than the patients not actively enrolled in DM. Results that reached significance are shown in bold.

Table 12: Logistic regression of disease management and written care plan analysis

	Number of patients exposed (unexposed)	OR (95% C.I.)[1]
Written care plan	111 (56)	**2.61 (1.16,5.86)**

[1] Model controls for months of observation, gap in DM activity, age, sex, race, and DM activity in diabetes and/or CHF

II. Medicaid Claim Analysis

In this analysis, we used Medicaid Claim data to evaluate the potential effects of Disease Management (DM) on hospitalizations and Emergency Department visits for Patients with asthma.

To evaluate the effect of disease management on the number of hospitalizations, length of stay and Emergency Department (ED) visits we investigated the inpatient and ED Medicaid claims for the asthma patients

We excluded patients from the analysis if

1) we could not assign an exposure group due to missing data (n=1,590)
2) unexposed patient died before 7/31/02 since they would have 0 months of observation (n=49)
3) unexposed was missing status data for all months of program period (n=1,513)
4) completed the initial assessment before July 2002 (n=147)

After exclusions, there were 10,582 patients in the analysis

Table 13: Demographic Data on Asthma Patients in utilization analysis

	Actively Disease Managed Patients N=3,551	Not Actively Disease Managed Patients N=7,031
Covariates		
Months of observation		
Mean, median	10.5, 11	10.4, 11
(Range)	(1-16)	(1-16)
Race – N (%)		
White	2,506 (70.6)	4,756 (67.6)
African-American	227 (6.4)	480 (6.8)
Asian-American	168 (4.7)	333 (4.7)
Other	650 (18.3)	1,462 (20.8)
Age – years		
Mean, median	34.7, 40	29.6, 29
(Range)	(1-91)	(1-75)
High cost (claims costs in top 25 to 16%)	638 (18.0)	1,075 (15.3)
High risk (claims costs in top 15%)	443 (12.5)	805 (11.5)
Gender – N (%)		
Male	1,149 (32.4)	2,749 (39.1)
Female	2,401 (67.6)	4,280 (60.9)
Active in other DM programs– N (%)		
Diabetes	441 (12.4)	15 (0.2)
CHF	177 (5.0)	3 (0.04)
Outcomes		
Hospitalizations		
Mean, median	0.2, 0	0.2, 0
(Range)	(0-10)	(0-11)
% with any hospitalizations– N (%)	449 (12.6)	623 (8.7)
Hospital days		
Mean, median	1.3, 0	1.1, 0
(Range)	(0-110)	(0-412)
ED visits		
Mean, median	1.3, 0	1.1, 0
(Range)	(0-58)	(0-65)
% with any ED visits– N (%)	1,323 (37.3)	2,147 (29.9)

The results show a significant decrease of at least 1 hospital day among those patients who are high cost or high risk, (Table 14). While DM does appear to be slightly protective against ED visits and hospitalizations, the associations were not significant. Significant results are reported in bold.

Table 14: Regression analyses- effect of asthma disease management and utilization

Outcome	All patients		High risk[3]		High cost[3]	
	Number of patients exposed (unexposed)	RR[1] (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)
ED visits	3,437 (6,722)	1.04 (0.92,1.17)	430 (778)	0.94 (0.75, 1.19)	623 (1,046)	0.87 (0.71,1.06)
Hospitalizations	3,437 (6,722)	1.08 (0.92,1.27)	430 (778)	0.94 (0.72,1.21)	623 (1,046)	0.84 (0.66,1.05)
		Coef.[2] (95% C.I.)				
Length of stay (days)	3,437 (6,722)	-0.01 (-0.28,0.27)	430 (778)	**-1.49 (-2.93,-0.06)**	623 (1,046)	**-1.22 (-2.44,-0.001)**

[1] Poisson regression models controls for months of observation, gap in activity, age, sex, race, DM activity in diabetes/CHF, high risk, high cost, and clustered by patient
[2] Linear regression models control for same as above
[3] Stratified models control for the above except not high risk, nor high cost

Sensitivity analyses

When we restricted to only those who had ED visits for the outcome of number of ED visits, there was no significant difference in the estimates. Similarly, when we restricted to patients who had at least one hospitalization, the estimates for the outcome of number of inpatient visits also did not significantly differ. The significant decrease in hospital days for the high cost group did lose significance while increasing in magnitude. The estimate for the restricted analysis was (coef. 95% CI, -2.92: -6.81, 0.97), as shown in the Appendix Table A1. The key differences between these two models are 1) including the zeros, from the people without hospitalizations, re-weights the proportion and thus changes the scale. The difference in the mean length of stay will be smaller because the mean length of stay decreases as the 0 hospital days are included. 2) The increase in numbers increases the precision we have to estimate the effect, thus we see more significance in the models that include those without hospitalizations/ED visits.

The logistic models for the outcome of any hospitalizations versus none did not differ significantly from those in Table 14. However, among all patients, the actively managed group was significantly more likely to have any ED visit than the control group

(RR, 95% CI, 1.23: 1.11-1.37). There was no significant association among the high cost and high risk groups.

When we excluded patients who were also actively involved in CHF or diabetes disease management programs, there was no significant difference in the estimates in the main analyses or the sensitivity analyses. (Data not shown.)

When we compared the low, medium and highly disease managed patients to the controls, the results did no significantly differ from the estimates for the whole population in Table 14. These results are reported in Appendix Table A2.

Congestive Heart Failure (CHF)

I. Medicaid claims analysis

In this analysis, we used Medicaid Claims data to evaluate the potential effects of Disease Management on hospitalizations and Emergency Department visits for Patients with CHF.

We excluded patients from the analysis if
1) we could not assign an exposure group due to missing data (n=472)
2) unexposed patient died before 7/31/02 since they would have 0 months of observation (n=22)
After exclusions, there were 2,830 patients in the analysis

Table 15: Demographic Data on CHF Patients in utilization analysis

	Actively Disease Managed Patients N=989	Not Actively Disease Managed Patients N=1,841
Covariates		
Months of observation		
Mean, median	10.8, 12	11.4, 13
(Range)	(1-16)	(1-16)
Race – N (%)		
White	712 (72.0)	1,274 (69.2)
Other	277 (28.0)	567 (30.8)
Age – years		
Mean, median	57.3, 57	55.9, 57
(Range)	(2-98)	(1-105)
High cost (claims costs in top 25 to 16%)	114 (11.5)	263 (14.3)
High risk (claims costs in top 15%)	186 (18.8)	359 (19.5)
Gender – N (%)		
Male	370 (37.4)	890 (48.3)
Female	619 (62.6)	951 (51.7)
Active in other DM programs– N (%)		
Diabetes	87 (8.8)	1 (0.1)
Asthma	152 (15.4)	6 (0.3)
Outcomes		
Hospitalizations		
Mean, median	0.4, 0	0.4, 0
(Range)	(0-12)	(0-15)
% with any hospitalizations– N (%)	241 (24.4)	432 (23.5)
Hospital days		
Mean, median	2.7, 0	3.2, 0
(Range)	(0-103)	(0-189)
ED visits		
Mean, median	1.5, 0	1.4, 0
(Range)	(0-47)	(0-54)
% with any ED visits– N (%)	441 (44.6)	718 (39.0)

The results show a slightly protective but non-significant effect of DM and number of ED visits, hospitalizations and length of stay (Table 16).

Table 16: Regression analyses- effect of CHF disease management and utilization

Outcome	All patients		High risk[3]		High cost[3]	
	Number of patients exposed (unexposed)	RR[1] (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)
ED visits	987 (1,801)	0.97 (0.81, 1.16)	184 (338)	1.03 (0.73, 1.44)	112 (243)	0.87 (0.54, 1.43)
Hospitalizations	987 (1,801)	1.02 (0.84, 1.23)	184 (338)	1.04 (0.73,1.48)	112 (243)	0.88 (0.57, 1.36)
		Coef.[2] (95% C.I.)				
Length of stay (days)	987 (1,801)	-0.60 (-1.35, 0.14)	184 (338)	-1.87 (-8.38, 4.64)	112 (243)	-1.58 (-5.04, 1.88)

[1] Poisson regression models controls for months of observation, gap in activity, age, sex, race, DM activity in diabetes/CHF, high risk, high cost, and clustered by patient
[2] Linear regression models control for same as above
[3] Stratified models control for the above except not high risk, nor high cost

Sensitivity analyses

When we restricted to only those who had ED visits for the outcome of number of ED visits, there was a borderline significant associated reduction in ED visits. Among all patients who had an ED visit the association of DM with the number of ED visits was 0.85 (073, 0.99). When we restricted to patients who had at least one hospitalization, the estimates for the outcomes of number of inpatient visits and length of stay also did not significantly differ.

There was a significant association between CHF disease management and having any ED visit among all patients. The actively managed group was 1.32 times more likely to have any ED visit than the control group. These results are shown in Appendix Table A3.

When we excluded patients with any overlapping participation in disease management programs there was no significant difference in the main analyses. Data not shown. However, when we made this exclusion in the sensitivity analyses the estimate for number of ED visits, among those with any ED visits but did lose significance (RR, 95% CI, 0.88: 0.76-1.03).

When we compared the treated to controls by disease management intensity we saw no difference in the results from those for the entire population in Table 14.

When we compared the low, medium and highly disease managed patients to the controls, patients with the medium intensity of 3-6 calls were more likely to have shorter hospital stays, by about 1 day (Coef, 95% CI, -1.27: -2.11, -0.43). These results are reported in Appendix Table A4.

Diabetes

I. Medicaid claims analysis

To evaluate the effect of disease management on the number of hospitalizations, length of stay, Emergency Department (ED) visits, HGBa1c tests, and retinal/ophthalmology exams we investigated the inpatient, ED Medicaid, HGBa1c test, and retinal/ophthalmology exam claims for the diabetes patients

We excluded patients from the analysis if

1) we could not assign an exposure group due to missing data (n=1,296)
2) control died before 7/31/02 (n=22)

After exclusions, there were 11,439 patients in the analysis

Table 17: Demographic Data on diabetes Patients in Medicaid claims analysis

	Actively Disease Managed Patients N=4,320	Not Actively Disease Managed Patients N=7,119
Covariates		
Months of observation		
Mean, median	10.6, 12	12.4, 16
(Range)	(1-16)	(1-16)
Race – N (%)		
White	2,892 (66.9)	4,275 (60.1)
African-American	317 (7.3)	600 (8.4)
Asian-American	377 (8.7)	838 (11.8)
Other	734 (17.0)	1,406 (19.8)
Age – years		
Mean, median	53.5, 54	52.7, 54
(Range)	(14-91)	(1-98)
High cost (claims costs in top 25 to 16%)	635 (14.7)	955 (13.4)
High risk (claims costs in top 15%)	1,032 (23.9)	1,378 (19.4)
Gender – N (%)		
Male	1,292 (29.9)	2,817 (39.6)
Female	3,028 (70.1)	4,299 (60.4)
Active in other DM programs– N (%)		
CHF	113 (2.6)	0 (0.0)
Asthma	455 (10.5)	4 (0.1)
Outcomes		
Hospitalizations		
Mean, median	0.2, 0	0.2, 0
(Range)	(0-11)	(0-29)
% with any hospitalizations– N (%)	13.6	14.5
Hospital days		
Mean, median	1.2, 0	1.7, 0
(Range)	(0-87)	(0-202)
ED visits		
Mean, median	1.0, 0	1.1, 0
(Range)	(0-95)	(0-72)
% with any ED visits– N (%)	35.0	34.5
Number of hgba1c tests done		
Mean, median	0.9, 1	0.7, 0
(Range)	(0-10)	(0-9)
% with any hgba1c tests – N (%)	2,189 (50.7)	2,678 (37.6)
Any retinal/ophthalmology exam– N (%)	1,042 (24.1)	1,558 (21.9)

The following results show a significant association between DM and improved process measures for all the diabetes patients regardless of cost or risk status (Table 18). Patients in DM are at least twice as likely to have and HGBa1c test than those not actively enrolled in DM. Similarly, there was a 40-50% increase in the likelihood that those in DM would have a retinal exam during the program period. The only significant associations of DM and utilization were a quarter of a day decrease in hospital stay among all patients. And among those in the high cost group there was a significant 1.5 day decrease on length of stay. Significant results are reported in bold.

Table 18: Regression analyses- effect of diabetes disease management and utilization and process measures

	All patients		High risk[3]		High cost[3]	
Outcome	Number of patients exposed (unexposed)	RR[1] (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)
ED visits	7,001 (4,317)	1.01 (0.90, 1.13)	1,031 (1,346)	0.93 (0.76, 1.15)	635 (933)	0.99 (0.75, 1.29)
Hospitalizations	7,001 (4,317)	1.08 (0.94, 1.23)	1,031 (1,346)	1.04 (0.84, 1.29)	635 (933)	1.01 (0.79, 1.28)
HGBa1c tests	7,001 (4,317)	**1.70 (1.61, 1.80)**	1,031 (1,346)	**1.45 (1.30,1.62)**	635 (933)	**1.57 (1.36, 1.82)**
		Coef. [2] (95% C.I.)				
Length of stay (days)	7,001 (4,317)	**-0.27 (-0.49, -0.04)**	1,031 (1,346)	-0.77 (-1.58, 0.04)	635 (933)	**-1.50 (-2.64, -0.36)**
		RR[3] (95% C.I)				
Any retinal exam	7,001 (4,317)	**1.52 (1.37, 1.69)**	1,031 (1,346)	**1.46 (1.19, 1.79)**	635 (933)	**1.44 (1.10, 1.89)**
Any HGBa1c test	7,001 (4,317)	**2.61 (2.38, 2.87)**	1,031 (1,346)	**2.07 (1.71, 2.50)**	635 (933)	**2.51 (1.96, 3.21)**

[1] Poisson regression models controls for months of observation, gap in activity, age, sex, race, DM activity in diabetes/CHF, high risk, high cost, and clustered by patient
[2] Linear regression models control for same as above
[3] Logistic regression models control for same as above, not clustered by patient
[4] Stratified models control for the above except not high risk, nor high cost

Sensitivity analyses

When we restricted to those who had ED visits for the outcome of number of ED visits, there was no significant difference. Likewise, when we restricted to patients who

had at least one hospitalization, the estimates for the outcomes of number of inpatient visits did not significantly differ. The estimates for the length of stay lost significance however the absolute decrease in days did become larger due to the change of scale. These results are shown in Appendix table A5.

The analyses of any ED visit versus none did reveal a significant and positive association with diabetes DM among all patients and those in the high risk group, as shown in Appendix Table A5. Actively managed diabetes patients were about 20% more likely to have any ED compared to those not actively managed.

When we excluded patients who were also actively enrolled in either asthma or CHF disease management we found that there were no differences from main results. Data not shown. However, when we made this exclusion in the sensitivity analysis, there was a borderline significant protective effect among patients who had any ED visits (RR, 95% CI, 0.92: 0.84-0.994).

When we compared the low, medium and highly disease managed patients to the controls, patients with the medium (3-5 calls) and high (6+ calls) intensity were still more likely to have shorter hospital stays, (Coef. 95% CI, -0.43:-0.74, -0.12) (Coef. 95% CI, -0.43: -0.83, -0.04**).** These results concur with those for the entire population in Table 18. However, the low intensity treated patients (0-2 calls) were not significantly different from the controls, with respect to hospital days. These results suggest a threshold effect of disease management for diabetes patients and length of hospital stay. These results are reported in Appendix Table A6.

II. HGBa1c lab value analysis

This analysis uses chart data provided by OMPRO. We chose a random sample of asthma patients of each of three groups who differed in their level of disease management. We sent a list 363 diabetes patients who we had activity data for sometime during the Disease Management (DM) period of July 2002 to October 2003. We received HGBa1c lab value data for 134 of the 363. Basic descriptive data on the patients are presented in Table 19.

Outcome/Quality variables

We dichotomized the last HGBa1c value recorded to normal (<=7.0) vs abnormal (>7) as the outcome.

We excluded patients from the analysis if

1) We could not assign an exposure group due to missing data (n=5)

After exclusions, there were 129 diabetes patients included in the analyses

Table 19: Demographics of diabetes patients (normal HGBa1c lab analysis) N=129

	Actively Disease Managed Patients N=112	Not Actively Disease Managed Patients N=17
Covariates		
Months of observation		
Mean, median	12.3, 13	12.6, 13
(Range)	(6-15)	(7-16)
Race – N (%)		
White	91 (81.3)	12 (706)
Other	21 (18.8)	5 (29.4)
Age – years		
Mean, median	50.3, 50	44.5, 48
(Range)	(20-82)	(1-70)
Gender – N (%)		
Male	29 (25.6)	9 (52.9)
Female	83 (74.1)	8 (47.1)
Active in other DM programs– N (%)		
CHF	112 (0.0)	0 (0.0)
Asthma	16 (14.3)	0 (0.0)
Outcome		
Normal hgba1c value for last test -N (%)	67 (59.8)	12 (70.6)

Enrollment in diabetes disease management was not significantly associated with having a normal HGBa1c lab value (Table 20). However, this analysis was severely restricted by a small sample size.

Table 20: Logistic regression of disease management and having a normal HGBa1c lab value analysis

	Number of patients exposed (unexposed)	OR (95% C.I.)[1]
HGBa1c (<=7.0)	112 (16)	0.56 (0.17-1.89)

[1] Model controls for months of observation, gap in DM activity, age, sex, race, and DM activity in diabetes and/or CHF

Discussion

Our analyses of the Disease Management Programs provided by Renaissance and McKesson do not allow us to make a general conclusion about the impact of Disease

Management for chronically ill patients. We further caution that our analyses are sensitive to the choice of comparison groups. As the data are observational and not experimental we chose to make the least biased comparisons we could with the data available. The results should be regarded with scrutiny of their respective biases. Furthermore, the utilization analyses also do not differentiate the causes of ED visit or hospitalization data and future analyses of how causes differ between the exposed and unexposed are certainly warranted.

Our evaluation of the Disease Management program for ESRD patients in WA State Medicaid supports the association between it and decreased hospitalization, ED visits, and inpatient days. The inherent limits of observational data preclude drawing causal inferences since other factors may underlie these improvements. However, within the limitations of existing data, since the advent of Disease Management, these processes and outcomes of care have been improved. With respect to what the concurrent analyses tell us, there does appear to be an association between patient contacts and improved laboratory values. However, there is also an association between provider contacts and worsening laboratory values which suggests that provider contacts occur more frequently in situations where laboratory tests are in fact worsening. This seems plausible especially since it is difficult to imagine why provider contact would lead to *worse* lab values and easy to imagine that worse lab values might lead to increased provider contact. We suspect that provider encounters are limited to situations where patients are noted to be doing poorly.

If most of the contacts (and most of the face to face contacts) between patients and disease management representatives occur at the dialysis center, then the results become even more difficult to interpret accurately. It may be that the association between improved outcomes and patient contact are entirely confounded the increased regularity of dialysis use. In other words it isn't disease management that is improving laboratory values, it is dialysis—something we already know works. We have tried to adjust for this by including a face to face variable in the regression models. Adjusting for this, patient contact is not significant in the All Labs analysis but is in the Status Change one.

Although these results suggest that there may be some improvement in laboratory test values associated with use of disease management (specifically, patient contact) services, the inherent limitations of this evaluation sampling design and data set make it impossible to reach definitive conclusions regarding the effectiveness of Renaissance disease management for this group of patients.

Our analyses of the Disease Management Program provided by McKesson for Asthma, CHF and diabetes patients in WA state Medicaid supports the association between it and improved process measures. It further suggests that there may be a decrease in hospital stay associated with asthma and diabetes disease management. The inherent limits of observational data preclude drawing causal inferences since it other factors may underlie these improvements. However, within the limitations of existing data, since the advent of Disease Management, these processes and outcomes of care have been improved.

As to the positive association with Disease Management and ED visits among the patients in the actively managed group this would require further analyses. It may be that those in the actively managed group are more ill and are more apt to seek medical care.

These results must be considered along side the results estimated for those who had some utilization. Once a disease managed patient had an ED visit, they were not more likely to have more ED visits, compared to patients not actively enrolled in DM.

In summary, Disease Management of chronically ill patients may well be associated with improved care. Two critical questions remain. First, would a more robust assessment (i.e. a prospective randomized trial) confirm these findings? Second, are these improvements (if causally related to DM) cost-effective from the perspective of DSHS.

APPENDIX

Table A1: Asthma – sensitivity analyses of disease management and utilization

Outcome	All patients			High risk[4]			High cost[4]		
	RR[1] (95% C.I)	RR[2] (95% C.I)	Number of patients exposed (unexposed) with utilization	RR[1] (95% C.I)	RR[2] (95% C.I)	Number of patients exposed (unexposed) with utilization	RR[1] (95% C.I)	RR[2] (95% C.I)	Number of patients exposed (unexposed) with utilization
ED visits	**1.23 (1.11, 1.37)**	0.96 (0.86, 1.06)	1,294 (2,066)	1.01 (0.76, 1.34)	0.94 (0.76, 1.16)	259 (457)	0.95 (0.75, 1.21)	0.89 (0.75,1.07)	383 (582)
Hospitalizations	1.14 (0.97, 1.33)	1.00 (0.90,1.11)	439 (597)	0.93 (0.70, 1.24)	0.98 (0.81,1.18)	134 (230)	0.82 (0.64, 1.05)	0.95 (0.81,1.12)	173 (283)
Length of stay (days)	---	Coef.[2] (95% C.I.) -1.74 (-4.25, 0.76)	439 (597)	---	**-4.39 (-8.51, -0.27)**	134 (230)	---	-2.92 (-6.81, 0.97)	173 (283)

[1] Logistic regression models controls for months of observation, gap in activity, age, sex, race, DM activity in diabetes/CHF, high risk, high cost, and clustered by patient

[2] Poisson regression models controls for same as above

[3] Linear regression models control for same as above

[4] Stratified models control for the above except not high risk, nor high cost

Table A2: Asthma – sensitivity analyses of intensity of disease management and utilization

Outcome	Low intensity 0-1 calls		Medium intensity 2-3 calls		High intensity 4+ calls	
	RR[1] (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)	Number of patients exposed (unexposed)
ED visits	1.11 (0.93, 1.32)	1,248 (7,178)	0.97 (0.79, 1.18)	1,001 (7,178)	1.01 (0.85, 1.19)	1,302 (7,178)
Hospitalizations	1.20 (0.94, 1.55)	1,248 (7,178)	1.08 (0.83, 1.40)	1,001 (7,178)	1.00 (0.81, 1.24)	1,302 (7,178)
Length of stay (days)	Coef.[2] (95% C.I.) 0.29 (-0.16, 0.75)	1,248 (7,178)	Coef.[2] (95% C.I.) 0.01 (-0.32, 0.35)	1,001 (7,178)	Coef.[2] (95% C.I.) -0.31 (-0.69, 0.08)	1,302 (7,178)

[1] Poisson regression models controls for months of observation, gap in activity, age, sex, race, DM activity in diabetes/CHF, high risk, high cost, and clustered by patient

[2] Linear regression models controls for same as above

Table A3: CHF – sensitivity analyses of disease management and utilization

Outcome	All patients			High risk[4]			High cost[4]		
	RR[1] (95% C.I)	RR[2] (95% C.I)	Number of patients exposed (unexposed) with utilization	RR[1] (95% C.I)	RR[2] (95% C.I)	Number of patients exposed (unexposed) with utilization	RR[1] (95% C.I)	RR[2] (95% C.I)	Number of patients exposed (unexposed) with utilization
ED visits	**1.32 (1.09, 1.59)**	**0.85 (0.73, 0.99)**	440 (694)	1.19 (0.80, 1.80)	0.96 (0.69, 1.34)	113 (172)	1.10 (0.65, 1.87)	0.83 (0.53, 1.28)	63 (110)
Hospitalizations	1.11 (0.90, 1.37)	0.96 (0.85, 1.09)	240 (413)	1.19 (0.79, 1.80)	0.93 (0.72,1.20)	82 (129)	0.90 (0.53, 1.53)	0.90 (0.66, 1.24)	45 (86)
Length of stay (days)	---	Coef.[2] (95% C.I.) -1.96 (-4.55, 0.63)	240 (413)	---	-1.01 (-6.55, 4.52)	82 (129)	---	-4.17 (-12.06, 4.52)	45 (86)

[1] Logistic regression models controls for months of observation, gap in activity, age, sex, race, DM activity in diabetes/CHF, high risk, high cost, and clustered by patient

[2] Poisson regression models controls for same as above

[3] Linear regression models control for same as above

[4] Stratified models control for the above except not high risk, nor high cost

Table A4: CHF – sensitivity analyses of intensity of disease management and utilization

Outcome	Low intensity 0-2 calls		Medium intensity 3-6 calls		High intensity 7+ calls	
	RR[1] (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)	Number of patients exposed (unexposed)
ED visits	1.01 (0.74, 1.35)	304 (1,841)	0.89 (0.66, 1.18)	330 (1,841)	1.04 (0.82, 1.31)	355 (1,841)
Hospitalizations	1.22 (0.91, 1.65)	304 (1,841)	0.81 (0.59, 1.13)	330 (1,841)	1.01 (0.78, 1.31)	355 (1,841)
Length of stay (days)	Coef.[2] (95% C.I.) 0.18 (-0.98, 1.34)	304 (1,841)	Coef.[2] (95% C.I.) **-1.27 (-2.11, -0.43)**	330 (1,841)	Coef.[2] (95% C.I.) -0.69 (-1.83, 0.45)	355 (1,841)

[1] Poisson regression models controls for months of observation, gap in activity, age, sex, race, DM activity in diabetes/CHF, high risk, high cost, and clustered by patient

[2] Linear regression models controls for same as above

Table A5: Diabetes – sensitivity analyses of disease management and utilization

Outcome	All patients			High risk[4]			High cost[4]		
	RR[1] (95% C.I)	RR[2] (95% C.I)	Number of patients exposed (unexposed) with utilization	RR[1] (95% C.I)	RR[2] (95% C.I)	Number of patients exposed (unexposed) with utilization	RR[1] (95% C.I)	RR[2] (95% C.I)	Number of patients exposed (unexposed) with utilization
ED visits	**1.24 (1.13, 1.36)**	0.91 (0.82, 1.01)	1,512 (2,406)	**1.23 (1.02, 1.48)**	0.87 (0.72, 1.05)	651 (552)	1.23 (0.97, 1.56)	0.89 (0.69, 1.14)	427 (339)
Hospitalizations	1.10 (0.96, 1.25)	1.01 (0.93, 1.10)	586 (1,006)	1.04 (0.85, 1.28)	1.01 (0.88,1.17)	265 (356)	0.97 (0.75, 1.25)	1.00 (0.84, 1.19)	177 (269)
		Coef.[2] (95% C.I.)							
Length of stay (days)	---	-1.04 (-2.38, 0.30)	586 (1,006)	---	-1.77 (-4.19, 0.65)	265 (356)	---	-2.96 (-6.15, 0.23)	177 (269)

[1] Logistic regression models controls for months of observation, gap in activity, age, sex, race, DM activity in diabetes/CHF, high risk, high cost, and clustered by patient

[2] Poisson regression models controls for same as above

[3] Linear regression models control for same as above

[4] Stratified models control for the above except not high risk, nor high cost

Table A6: Diabetes – sensitivity analyses of intensity of disease management and utilization

Outcome	Low intensity 0-2 calls		Medium intensity 3-5 calls		High intensity 6+ calls	
	RR[1] (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)	Number of patients exposed (unexposed)	RR (95% C.I)	Number of patients exposed (unexposed)
ED visits	1.06 (0.93, 1.20)	1,621 (7,119)	1.00 (0.81, 1.23)	1,394 (7,119)	0.93 (0.80, 1.09)	1,305 (7,119)
Hospitalizations	1.11 (0.92, 1.34)	1,621 (7,119)	0.97 (0.79, 1.21)	1,394 (7,119)	1.07 (0.88, 1.31)	1,305 (7,119)
Length of stay (days)	Coef.[2] (95% C.I.) -0.04 (-0.32, 0.24)	1,621 (7,119)	Coef.[2] (95% C.I.) **-0.43 (-0.74, -0.12)**	1,394 (7,119)	Coef.[2] (95% C.I.) **-0.43 (-0.83, -0.04)**	1,305 (7,119)

[1] Poisson regression models controls for months of observation, gap in activity, age, sex, race, DM activity in diabetes/CHF, high risk, high cost, and clustered by patient

[2] Linear regression models controls for same as above

McKesson Satisfaction Survey Results

April, 2005

From October, 2002 to December 2003, CareCall, Inc. surveyed by telephone a sample of Washington state Medicaid patients with asthma, diabetes, or heart failure to assess their satisfaction with the McKesson Disease Management Program. Telephone contact was attempted for patients who were in active disease management and who had received at least one assessment. Table 1 gives the total number of persons in disease management during this time, the number of persons for whom an attempt was made to survey, and the number of respondents within each disease group. Approximately 17% of persons in the target survey sample declined participation; 4-17% were not questioned because they did not speak English. Other non-response was due to inability to contact. Overall response rate varied from 34.7% for patients with heart failure to 42.9% for patients with asthma.

Table 1: Sample and Response Rate

	In Disease Management Program	Survey Attempted	Declined Participation (%)	Non-English Speaking (%)	Respondents (Response rate)
Asthma	14,567	1,237	216 (17.5%)	49 (4.0%)	531 (42.9%)
Diabetes	13, 378	1,806	294 (16.3%)	255 (14.1%)	662 (36.7%)
Heart Failure	3,523	392	68 (17.2%)	63 (16.7%)	136 (34.7%)

Respondent Demographics

Respondents were, for the most part, between 45 and 64 years of age, although the asthma patients tended to be younger than those with heart failure or diabetes (Table 2). Over 75% of respondents were White (Table 3). Thirty-eight to forty-two percent of respondents had more than a high school education (Table 4).

Table 2 – Age Distribution of Respondents

	ASTHMA N = 531	CHF N = 136	DIABETES N = 661
14-18	22 (4.1%)	0 (0.0%)	0 (0.0%)
19-34	53 (10.0%)	2 (1.5%)	40 (6.1%)
35-44	106 (20.0%)	6 (4.4%)	102 (15.4%)
45-54	200 (37.7%)	40 (29.4%)	239 (36.2%)
55-64	135 (25.4%)	73 (53.7%)	246 (37.2%)
65-69	8 (1.5%)	9 (6.6%)	25 (3.8%)
70-74	3 (0.6%)	0 (0.0%)	4 (0.6%)
75-79	0 (0.0%)	3 (2.2%)	0 (0.0%)
Refused	4 (0.8%)	3 (2.2%)	7 (0.8%)

Question 3: Race of Respondents			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 661**
Asian	5 (0.9%)	1 (0.7%)	13 (2.0%)
Black	34 (6.4%)	12 (8.8%)	34 (5.1%)
Native American	36 (6.8%)	11 (8.1%)	42 (6.4%)
Hispanic	15 (2.8%)	2 (1.5%)	29 (4.4%)
Other	16 (3.0%)	3 (2.2%)	14 (2.1%)
Refused	22 (4.1%)	6 (4.4%)	22 (3.3%)
White	403 (75.9%)	101 (74.3%)	507 (76.7%)

Question 4: Highest education level Attained			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 661**
Less than 8th grade	23 (4.3%)	11 (8.1%)	40 (6.1%)
Some high school	127 (24.0%)	24 (17.7%)	125 (18.9%)
HS graduate or GED	175 (33.0%)	41 (30.2%)	206 (31.2%)
Some college	157 (30.0%)	39 (28.7%)	210 (31.8%)
College graduate	43 (8.1%)	19 (14.0%)	70 (10.6%)
Refused	6 (1.1%)	2 (1.5%)	10 (1.5%)

Satisfaction

Over 92% of patients were either satisfied or very satisfied with the program (Table 5). Patients were overwhelmingly satisfied with their contacts with nurses in the program (Tables 6-9). Approximately 90% of respondents said that their experience with the disease management program made them think more positively about their health plan (Medicaid) and over 95% said they would recommend the program.

Table 5: Overall satisfaction			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
Very dissatisfied	4 (0.8%)	0 (0.0%)	9 (1.4%)
Dissatisfied	3 (0.6%)	0 (0.0%)	8 (1.2%)
Neutral	25 (4.7%)	1 (0.7%)	22 (3.3%)
Satisfied	89 (16.8%)	12 (8.8%)	81 (12.2%)
Very satisfied	401 (75.5%)	121 (89.0%)	532 (80.4%)
Unsure	9 (1.7%)	2 (1.5%)	10 (1.5%)

Table 6: Satisfaction with nurse's ability to answer questions			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
Very dissatisfied	0 (0.0%)	0 (0.0%)	4 (0.6%)
Dissatisfied	1 (0.2%)	1 (0.7%)	5 (0.8%)
Neutral	9 (1.7%)	2 (1.5%)	21 (3.2%)
Satisfied	57 (10.7%)	14 (10.3%)	91 (13.8%)
Very satisfied	455 (85.7%)	115 (84.6%)	528 (79.8%)
Unsure	9 (1.7%)	4 (2.9%)	13 (2.0%)

Table 7: Satisfaction with nurse's ed. and support			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
Very dissatisfied	1 (0.2%)	0 (0.0%)	9 (1.4%)
Dissatisfied	0 (0.0%)	1 (0.7%)	9 (1.4%)
Neutral	15 (2.8%)	1 (0.7%)	19 (2.9%)
Satisfied	71 (13.4%)	15 (11.0%)	95 (14.4%)
Very satisfied	436 (82.1%)	115 (84.6%)	510 (77.0%)
Unsure	8 (1.5%)	4 (2.9%)	20 (3.0%)

Table 8: Satisfaction with nurse's understanding			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
Very dissatisfied	0 (0.0%)	1 (0.7%)	7 (1.1%)
Dissatisfied	2 (0.4%)	0 (0.0%)	10 (1.5%)
Neutral	12 (2.3%)	1 (0.7%)	14 (2.1%)
Satisfied	51 (9.6%)	14 (10.3%)	81 (12.2%)
Very satisfied	454 (85.5%)	117 (86.0%)	538 (81.3%)
Unsure	12 (2.3%)	3 (2.2%)	12 (1.8%)

Table 9: Comfort with nurses			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
Very dissatisfied	1 (0.2%)	0 (0.0%)	8 (1.2%)
Dissatisfied	8 (1.5%)	1 (0.7%)	9 (1.4%)
Neutral	27 (5.1%)	4 (2.9%)	27 (4.1%)
Satisfied	61 (11.5%)	11 (8.1%)	90 (13.6%)
Very satisfied	429 (80.8%)	115 (84.6%)	522 (78.9%)
Unsure	5 (0.9%)	5 (3.7%)	6 (0.91%)

Contact with the Program

Most respondents reported that they spoke with a program nurse monthly or bimonthly and the vast majority was content with the amount and duration of the contact.

Table 10: How often spoken with program nurse			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
Weekly	24 (4.5%)	6 (4.4%)	26 (3.9%)
Monthly	264 (49.7%)	91 (66.9%)	312 (47.1%)
Every other month	203 (38.2%)	32 (23.5%)	280 (42.3%)
Not at all	3 (0.6%)	3 (2.2%)	8 (1.2%)
Unsure	37 (7.0%)	4 (2.9%)	36 (5.4%)

Table 11: Amount of contact			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
Want more calls	45 (8.5%)	12 (8.8%)	73 (11.0%)
About right	453 (85.3%)	115 (84.6%)	549 (82.9%)
Want fewer calls	29 (5.5%)	6 (4.4%)	36 (5.4%)
Never received a call	0 (0.0%)	1 (0.7%)	0 (0.0%)
Unsure	4 (0.8%)	2 (1.5%)	4 (0.6%)

Table 12: Length of calls			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
.	0 (0.0%)	0 (0.0%)	1 (0.2%)
Too short	3 (0.6%)	2 (1.5%)	9 (1.4%)
About right	472 (88.9%)	123 (90.4%)	572 (86.4%)
Too long	52 (9.8%)	8 (5.9%)	68 (10.3%)
Never rcvd. a call	1 (0.2%)	1 (0.7%)	1 (0.2%)
Refused	0 (0.0%)	0 (0.0%)	1 (0.2%)
Unsure	3 (0.6%)	2 (1.5%)	10 (1.5%)

Approximately two-thirds to three-quarters of respondents recalled receiving mailed program materials (Table 13); about 90% of those who receive the mailings said they were useful. Only 18-26% of respondents indicated that they called the program (Table 14); these calls were largely for condition-specific or general health related advice and were deemed helpful by over 90% of those making calls.

Table 13: Received mailed program materials?			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 663**
No	91 (17.1%)	28 (20.6%)	113 (17.0%)
Refused	0 (0.0%)	0 (0.0%)	51 (7.7%)
Unsure	29 (5.5%)	9 (6.6%)	49 (7.4%)
Yes	411 (77.4%)	99 (72.8%)	450 (67.9%)

Table 14: Have you called program?			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
No	384 72.3%)	112 (82.4%)	520 (78.6%)
Unsure	7 (1.3%)	0 (0.0%)	5 (0.8%)
Yes	140 (26.4%)	24 (17.7%)	137 (20.7%)

Effects of the Program

Respondents reported that the program helped them change the way they (self-) managed their conditions. Among asthma patients, 19.1 took their medication more regularly, 18.1 used the peak flow meter more often, and 15.6% said they avoided asthma inducing conditions and situations (e.g., pets, smoke) because of the program. Among patients with heart failure, 42.7% reported that they changed their diet and 8.8% monitored their weight more regularly. For those with diabetes, 35.4% reported that they changed their diet; and 8.3% said that they monitored their blood sugar more regularly. (Note that the survey permitted the reporting of only one "change.") Seventy-five to eighty percent of patients felt the program helped them communicate better with their physicians

Likes and Dislikes

When asked what they liked best about the program, most of the respondents mentioned the nurses (Table 15). When asked what they would change about the program, 72% to 81% of respondents said "nothing" (Table 16).

Table 15: What do you like best about program?			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
Info provided by nurse	176 (33.2%)	47 (34.6%)	191 (86.9%)
Nurse is sympathetic/ understanding	193 (36.4%)	54 (39.7%)	229 (34.6%)
Ability to call nurse	74 (13.9%)	18 (13.2%)	81 (12.2%)
Materials sent by mail	6 (1.1%)	2 (1.5%)	5 (0.8%)
Frequency of contact with nurse	27 (5.1%)	3 (2.2%)	34 (5.1%)
Home health visit	0 (0.0%)	1 (0.7%)	11 (1.7%)
Other	19 (3.6%)	1 (0.7%)	37 (5.6%)
Unsure	36 (6.8%)	10 (7.4%)	74 (11.2%)

Table 16: What would you change about program?			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 662**
More written materials	8 (1.5%)	1 (0.7%)	27 (4.1%)
More calls	15 (2.8%)	3 (2.2%)	25 (3.8%)
Getting in touch w/ nurse when calling in	4 (0.8%)	0 (0.0%)	6 (0.9%)
More prompt f/u by nurse	1 (0.2%)	0 (0.0%)	2 (0.3%)
Longer calls	1 (0.2%)	0 (0.0%)	2 (0.3%)
Shorter calls	16 (3.0%)	2 (1.5%)	13 (2.0%)
None	421 (79.3%)	110 (80.9%)	477 (72.1%)
Other	37 (7.0%)	13 (9.6%)	67 (10.1%)
Unsure	28 (5.3%)	7 (5.2%)	43 (6.5%)

Change in Health

Finally, respondents were asked to compare their health at the time of the survey with their health six months prior. Forty to forty-five percent indicated that their health had improved, while only 14% to 19% reported that their health was worse (Table 17). In the absence of a control group, unfortunately, is impossible to tease out the effect of disease management on these changes in perceived health.

Table 17: Compared to 6 months ago, your health is?			
	ASTHMA N = 531	**CHF N = 136**	**DIABETES N = 661**
Much better	78 (14.7%)	23 (16.9%)	94 (14.2%)
Somewhat better	153 (28.8%)	38 (27.9%)	172 (26.0%)
About the same	189 (35.6%)	53 (39.0%)	287 (43.4%)
Somewhat worse	78 (14.7%)	14 (10.3%)	72 (10.9%)
Much worse	21 (4.0%)	5 (3.7%)	20 (3.0%)
Unsure	12 (2.3%)	3 (2.2%)	16 (2.4%)

Summary

Among those surveyed, there was overwhelming satisfaction with the disease management program. Most respondents had contact with the program monthly or bi-monthly. Patients especially appreciated the contact with nurses, whom they trusted and found helpful. A majority of respondents reported that they change their health behaviors as a result of contact with the disease management program and a large majority said that the program helped them communicate better with their physician.

STATE OF WASHINGTON
MEDICAL ASSISTANCE ADMINISTRATION
MCKESSON DISEASE MANAGEMENT SAVINGS
EVALUATION PROGRAM YEAR ONE

Prepared by:

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A MILLIMAN GLOBAL FIRM

Milliman

Consultants and Actuaries

TABLE OF CONTENTS

SECTION I

EXECUTIVE SUMMARY

Program Overview

The McKesson Health Solutions (McKesson) disease management (DM) program for Washington Medicaid clients consists of three disease specific programs – asthma, diabetes and congestive heart failure (CHF) – and a 24-hour nurse hotline. Management of the asthma clients began April 1, 2002, with implementation of the other programs July 1, 2002. Through a variety of educational activities and client interventions, the programs are intended to improve the quality and efficiency of the care provided to eligible Medicaid clients.

Purpose of this Analysis

As part of the contractual agreement between the Washington Medical Assistance Administration (MAA) and McKesson, minimum savings in excess of program fees have been guaranteed by McKesson. In particular, McKesson has placed 80% of the program fees received at risk with respect to this financial guarantee. An additional guarantee related to non-financial program outcomes is also contained in the contract, but the assessment of that guarantee is not part of this analysis. MAA has requested that Milliman quantify the savings for the first year of the disease management program relative to the savings guarantee.

General Methodology

Our approach to quantification of the program savings is to summarize the per member per month (PMPM) costs of the disease specific cohorts before and after program implementation. Baseline PMPM costs are computed for the 12 months immediately prior to program implementation. These costs are trended forward to the first program year as a benchmark, or a theoretical estimate of program year expenditures in the absence of the DM program. Program year PMPM costs are then compared to this benchmark to determine gross savings. Program fees are subtracted to derive net savings, which are then compared to the savings guarantee. While relatively simple in concept, numerous assumptions and methodological decisions are required to perform this computation, many of which could have a material impact on the results.

Results

Our comparison of benchmark costs to actual program costs yields the following results:

- Asthma gross savings of $9.52 PMPM, or $401,488 for the program year.
- Diabetes gross savings of $36.42 PMPM, or $3,100,065 for the program year.

- Heart Failure gross savings of $16.83 PMPM, or $284,353 for the program year.

Program fees are subtracted from these gross savings amounts to produce the following net savings:

- Asthma net savings of -$1,081,149 for the program year.
- Diabetes net savings of -$221,210 for the program year.
- Heart Failure net savings of -$968,678 for the program year.

These net savings amounts are then compared to the savings guarantees for each disease cohort, which cumulatively results in a shortfall of $3,599,715.

Comments on Findings

We understand that this shortfall is not consistent with general expectations. As such, we offer the following considerations as this result is evaluated:

- Disease screens (models that rely on claim data to identify disease specific populations) are imperfect. They can falsely identify clients and can fail to promptly identify clients due to the lag time in the claim reporting and payment process. Incomplete eligibility and/or claim data can also affect the timely identification of clients. In addition, we note that Milliman's application of the contractually defined disease screen for the study program period does not precisely match the master files of identified clients maintained by McKesson.
- As is typically the case with Medicaid eligibility, retroactive changes can impact the cost effectiveness of the program. For example, clients may be properly identified by the McKesson disease screen, enrolled in the DM program and actively managed, only to later be retroactively removed from eligibility. In this situation, the potential DM savings for this client are eliminated from the calculations. As acknowledgement of this situation, program fees for retroactively removed clients have been excluded from the savings guarantee calculation.
- Modeling assumptions can influence results, such as the decision to retain clients for study purposes in their original disease classification, even if higher intensity disease states are later identified. As an illustration, a client originally identified by McKesson as a diabetic, and later identified as also having CHF, is by contract maintained for billing and study purposes as a diabetic. An exception to this rule exists for clients identified with asthma in the first three program months that were then identified with diabetes or CHF at the start of those programs.

- The source and methodology for developing the trend assumptions used to convert the baseline PMPM costs to benchmark PMPM costs has a significant impact on the projected savings. The trend assumptions used in this model are detailed later in this report.

Caveats

Milliman has relied on data and information provided by MAA and McKesson to perform the savings calculations presented in this report. While we have performed extensive reasonableness checks of the data, we have not performed an independent audit. Inaccuracies in the underlying data could distort the study results.

It is important to note that this savings calculation is intended to be consistent with the contractual provisions agreed to by MAA and McKesson. Numerous "gaps" in the contractual methodology have subsequently been negotiated between MAA and McKesson with Milliman's assistance. As such, this report should not be used outside this context as a broader assessment of program value or as an assessment of DM programs in general.

The information contained in this letter, including the enclosures, has been prepared for MAA and their consultants and advisors. It is our understanding that the information contained in this letter may be utilized in a public document. To the extent that the information contained in this report is provided to third parties, the report should be distributed in its entirety. Any user of the data must possess a certain level of expertise in actuarial science and healthcare modeling, so as not to misinterpret the data presented.

Milliman makes no representations or warranties regarding the contents of this report to third parties. Likewise, third parties are instructed that they are to place no reliance upon this report prepared for MAA by Milliman that would result in the creation of any duty or liability under any theory of law by Milliman or its employees to third parties. Other parties receiving this report must rely upon their own experts in drawing conclusions about the MAA DM program.

SECTION II

METHODOLOGY

The method used to quantify savings was based upon discussions between McKesson and MAA. We have compared the costs of the diseased population for the first year of the program to a control population in the year prior to launch of the DM programs (baseline year). Adjustments made to either the program year data or baseline year data are documented below. In addition, methods for identifying eligible diseased members for the study are also described.

The program year for Asthma is 4/1/02 through 3/31/03 and the program year for diabetes and CHF is 7/1/02 through 6/30/03. Data for the analysis of both program and baseline years directly included run-out claims for six months with completion factors applied to each period.

Medicaid Programs Excluded From Disease Management

The following classes of Medicaid members were not eligible for DM. These members were not included in the monthly DM premium paid to McKesson, were not managed, and therefore, are not part of this study. The members excluded from DM eligibility are as follows:

- Members who are also eligible for Medicare
- Institutionalized members
- Medically indigent members
- Alcohol Drug Abuse Treatment and Support Act (ADATSA) members
- Foster Care/Adoption members
- Refugees
- Those categorized as Pregnant Women (S Women)
- Medically Needy
- State-funded Children
- Take Charge Family Planning members

- Children's Health Insurance Program (CHIP) members
- Specified Low-Income Medicare Beneficiary (SLMB) members
- Expanded Specified Low-Income Medicare Beneficiary (SLMB) members
- Cervical/Breast Cancer Demonstration Project members
- General Assistance Unemployable (GAU) members
- Person Meeting Qualified Disabled Working Individual (QDWI) criteria only, not CN/MN
- Family Medical Reinstatement for Temporary Assistance to Needy Families (TANF) members
- Categorically Needy Pregnant Women – income greater than CNIL; not more than 185% of FPL and Temporary Assistance to Needy Families (TANF) members
- Disabled Non SSI members
- Members under two years old

In addition to the exclusions above, all TANF members and members under 18 years old are excluded from the diabetes and heart failure programs. Note that these exclusions are applied on a monthly basis. If a member changes aid categories midyear, they can then be disease management eligible.

Other Populations Excluded From Disease Management

In addition to being excluded from disease management due to Medicaid aid classification, members can also be excluded due to other factors. Some of these factors will exclude a member from any management by McKesson; others only exclude the population from the savings analysis. These additional exclusions are as follows:

Excluded from the program and the savings analysis:

- Members with ESRD
- Members with COPD are excluded from the Asthma program. Note that we have interpreted this exclusion to mean that if a member has Asthma and COPD they are excluded from the Asthma program, but if they have Asthma, COPD and CHF they are included and managed in the CHF program.
- Members with any Medicare eligibility during the year

- Members with HIV/AIDS are excluded from the program
- Members who have been in a SNF/LTC facility for more than 30 consecutive days
- Members with congenital heart disease are excluded from the CHF program

Excluded from the analysis, but still managed:

- Members who have had a transplant
- Members with schizophrenia (beginning 1/1/2003, prior to that excluded entirely)
- Members with cancer
- Members with less than three consecutive months of eligibility during the study year
- Annual member costs in excess of $150,000 were excluded from the study. The member and their claims under the threshold are not excluded.
- Trauma claims were also removed from the analysis. Only costs were removed, not members.

The purpose of this second set of exclusions is to remove non-DM related volatility from the savings calculation.

The codes used to identify these exclusions, as well as the managed diseases, were produced by McKesson and included in the contract language. It has not been Milliman's intent to alter the identification process. We have included these criteria in Appendix C.

Disease Identification Process

The basis of our analysis is the comparison of two populations; a control population and one that has been subjected to DM. Theoretically, if DM is the only differentiating factor between the two populations, the utilization and cost differences between these two populations can be attributed to DM. It was predetermined that the control population to be used in this comparison is the DM eligible population in the state of Washington the year prior to DM implementation.

We have attempted to mimic the monthly process used by McKesson to identify potential management clients. This process involves the following steps each month:

1. Claims and eligibility data are provided monthly to McKesson by the State. The eligibility file contains member identification codes; aid codes other information including date of birth for the DM eligible population at the time of the data extract.

The claims file contains claims incurred and paid in the previous twelve months for the eligible population.

2. McKesson then processes this data to identify anyone who meets their disease screening criteria, using the twelve-month data extract. The disease screen criteria are summarized in Appendix B.

3. All members identified are then compared to members previously identified. All newly identified diseased clients are then added to a master file containing the member identification, disease state and month of identification.

4. This complete file of managed clients is then compared to the current eligibility file. Clients who are no longer eligible for the program are removed from the file. Members who remain in this file are "enrolled" in the management program.

To the extent possible, this is the process followed for both our baseline population and the program year population. Other issues considered in the identification process are:

- If a member has multiple managed diseases that member is only assigned to one disease state. A member with CHF, diabetes and asthma will be counted for purposes of this analysis as a CHF client. A member identified as having diabetes and asthma is counted in this analysis as a diabetes client.

- Once a member is identified as having one of the three managed diseases, their disease state is not generally modified. If in the first month of the program a member is identified as a diabetic, they remain a diabetes client in this analysis, even if it is determined later that the patient also has CHF. Even if there are no identifying diagnosis codes in the most recent year, a previously identified diseased client is not dropped from the program unless they lose eligibility.

- The asthma program was launched three months prior to the diabetes and CHF programs. In these initial three months, all asthma patients were identified and included in the asthma program, even if they also could be identified as having diabetes or CHF. At the time of the introduction of the diabetes and CHF programs, if one of these previously classified asthma clients could also be identified as having CHF, diabetes or both, they were reclassified based on the disease hierarchy described above.

- Through sources other than claims data, such as a provider referral or 24-hour nurse line call, an eligible client can be added to the managed population.

- After being contacted by McKesson, if it is determined that the member does not have the condition identified from the claim data, they are removed from the master managed client file.

As part of our analysis, we used the process described above to identify members who would have been included in the baseline period if the program had existed at that time. We generated the program year diseased cohorts independent of the development of the baseline diseased cohorts.

Although every effort was made to use exactly identical methods to generate both the base year cohorts and the program year cohorts, the last two bullet points listed above cannot be replicated in both periods. This creates an unavoidable mismatch between base and program years due to 1) the inability to identify diseased clients through means other than claim data in the base period, and 2) excluding members who do not have the disease from the program year without a comparable exclusion in the base year. Note that if a member has indicated that they do not have the identified disease in the program period, they are excluded from the base period as well to minimize this problem. However, there remains a mismatch.

Application of Exclusions

After identifying those who meet the disease criteria for each of the three managed diseases, clients that met the exclusion criteria defined by McKesson were removed. Age and aid category exclusions were determined on a monthly basis.

If the member did not have at least three consecutive months of DM eligibility during the base year or immediately prior to the base year, that member was excluded entirely from the base year. Likewise, if a member did not have at lease three consecutive months of DM eligibility during the program year or immediately prior to the program year, that member was excluded in the program year.

Other exclusions were based on a three-year screening period. If a member was identified as having one of the excluded diseases listed above in the year prior to the base year, the base year or the program year, that member was excluded entirely from both the base year and the program year studies.

Trend Calculation

Gross savings for the program are computed by comparing program year costs to trended baseline year costs. In order to construct an appropriate trend rate for this program, it was predetermined and contractually agreed to use the change in per member per month (PMPM) costs between the baseline and program periods for the eligible population determined not to have one of the managed diseases. While this analysis could be performed using various methodologies and levels of specificity, the following parameters were agreed upon between MAA and McKesson:

- The non-diseased populations should be representative of those eligible for each of the DM programs. Therefore, separate analyses were performed for the CHF/Diabetes

and Asthma programs because the TANF population is eligible only for Asthma management.

- Similarly, because CHF/Diabetes program began three months later than Asthma, the pre and post periods for PMPM calculations differ from each other and mimic the baseline and program periods of the study analyses.
- Exclusions applied to the study populations (e.g. cancer patients, annual claims in excess of $150,000) are similarly excluded from the trend analysis.
- While separate trend rates could be computed and applied at a service line level of detail (e.g. hospital, Rx), it was agreed that an aggregate level trend rate would be used for this analysis.

For the asthma program, we also recognized a significant shift in the case mix of the non-diseased population between the base and program years. In the base year, the TANF population represented 68% of the non-disease asthma eligibles, but only represented 58% of this population in the program year. At the same time, the percentage of TANF eligibles in the identified asthma population held relatively flat at 39%. This case mix shift in the trend rate computation has been accounted for by initially computing the asthma program trend separately for the TANF and non-TANF populations and blending based on the program period case mix.

The resulting annual trend rate used for all three diseases is 9.34%.

PMPM Costs

The resulting PMPM costs for each disease cohort, with category of service utilization and cost detail are provided in Appendix A.

SECTION III

SAVINGS COMPUTATION

Washington Medical Assistance Administration
Disease Management Program
Savings Settlement Calculation

	Heart Failure	Diabetes	Asthma	Total
Baseline Period Cost				
Member Months in Study	12,116	62,684	38,450	113,250
Cost PMPM	$1,057.63	$741.59	$477.56 [1]	$688.02 [1]
Program Period Cost (Year 1)				
Member Months in Study	13,535	72,239	42,161	127,935
Cost PMPM	$1,040.81	$705.17	$468.04	$662.53 [2]
Gross Savings Calculation				
Study Population (Member Months)	13,535	72,239	42,161	127,935
Gross Savings for Study Population PMPM	$16.83	$36.42	$9.52	$25.48 [2]
Aggregrate Gross Savings for Study Population	$227,789	$2,631,094	$401,488	$3,260,371 [2]
Managed Population Excluded From Study (Member Months)[3]	3,361	12,876	2,472	18,709
Assumed Aggregrate Savings for Excluded Population	$56,564	$468,971	$8,486	$534,021
Aggregrate Gross Savings	$284,353	$3,100,065	$409,973	$3,794,392 [2]
Program Fees				
Total Progam Fees Paid	$1,727,285	$4,444,042	$2,102,623	$8,273,950
Estimated Allocation of Nurse Line Fees	$289,677	$717,755	$441,357	$1,448,789
Estimated Percent of Population Retroactively Removed	12.8%	10.9%	10.2%	
Program Fees for Population Retroactively Removed	$184,576	$405,011	$170,144	$759,732
Net Program Fees	$1,253,032	$3,321,275	$1,491,122	$6,065,429
Net Savings				
Net Savings	-$968,678	-$221,210	-$1,081,149	-$2,271,037
Performance Guarantee				
Performance Guarantee Rate	1.48%	1.48%	0.61%	
Total Study Performance Guarantee[4]	$264,473.02	$934,184.05	$130,020.96	$1,328,678
Contractual Settlement				
Contractual Settlement	-$1,233,151	-$1,155,394	-$1,211,169	-$3,599,715

[1]Composite based on program period member months.

[2]These figures have been corrected from the original report issued 12/03/2004. These changes do not affect the final settlement figures.

[3]Managed excluded population includes those enrolled in the DM program, but excluded from the savings calculation.

[4]Computed as Performance Guarantee Rate x Baseline Trended Cost PMPM x Total Managed Member Months.

SECTION IV

ALTERNATIVE PERSPECTIVES

As mentioned above, modifications could be made to the methodology of analyzing the savings associated with the DM program. Several examples are presented below.

Modifications to the Disease Screen

A disease screen that identifies disease specific clients, based on diagnosis coding contained in claim records, can produce false positive identifications. Simple miscodes would be one example. Another would be diagnoses associated with diagnostic testing that could represent a condition being tested for, as opposed to the actual presence of the condition.

As an example, the heart failure program has relied on the presence of a single occurrence of one of the specified diagnosis codes. A revised version of the savings analysis could modify the requirement to be at least two separate occurrences of one of the specified diagnosis codes, excluding radiology and lab/pathology procedures. The same multiple occurrence criteria could be applied to the co-morbidity exclusions (e.g., cancer).

Reliance on McKesson Master File

As mentioned above, the application of the contractual disease screens to the underlying program period study results in some inconsistencies with the McKesson master file of identified clients. One could argue that the inclusion of only those clients in the program period analysis that were identified by McKesson creates a better assessment of the effectiveness of the program. (At the same time, this approach introduces additional complications, most notably an inconsistency with the benchmark rate calculated in the base year.)

Consideration of Risk Adjustment

Another consideration is the possibility that the average health status of the DM identified population can deteriorate, relative to the eligible Medicaid population as a whole. Such deterioration could negate DM savings, making the program look less effective than it really is. As part of the Milliman analysis, claim data from the baseline and program periods were processed, using the Chronic Illness and Disease Payment System (CDPS), to assess the relative health status between periods and between populations. This adjustment factor did not have a material impact on the composite savings for the program, and was therefore, not included in the primary methodology presented above.

SECTION V

CONCLUSION

While we recognize that this analysis results in a sub-par financial performance for the DM program, we note that there could be several contributing factors that may not repeat in future program years, such as:

- Increased access to care. We note that the non-TANF asthma population shows annual office visit utilization per 1000 that increases by approximately 50% in the program year. This has the appearance that demand was being unmet prior to the implementation of DM. This has likely increased the quality of care and in theory should produce savings in future years.

- Credibility. The DM populations being studied are relatively small. Some of the utilization changes could be the result of the natural volatility in the utilization of health care services. Note that the rate per 1000 for inpatient admissions and emergency room visits for the CHF population slightly increases from the base to the program year. This is not consistent with expectations of the DM program and has the appearance of claim volatility outside the control of a DM program. This hypothesis could be further analyzed by examining the diagnoses associated with inpatient and emergency room care.

- First year analysis. It would be reasonable to assume that significant time was spent by the DM vendor in the early months of program implementation with efforts to identify and contact diseased clients. This could effectively delay any benefits of the educational and intervention efforts of the vendor. It would be reasonable to assume little or no gross savings in the early months of the program.

Also, as we have pointed out in the report, alternatives exist with respect to the savings calculation methodology.

Appendix A-1
Washington Medical Assistance Administration
Heart Failure
Cost Model Summary

	Baseline Year (7/01-6/02)				Program Year 1 (7/02-6/03)			
Member Months				12,116				13,535
	Admits	*Days*	*Unit*	*Paid*	*Admits*	*Days*	*Unit*	*Paid*
Hospital Inpatient	*Per 1,000*	*Per 1,000*	*Cost*	*PMPM*	*Per 1,000*	*Per 1,000*	*Cost*	*PMPM*
Medical	416	1,643	$1,645.07	$225.23	433	1,674	$1,658.53	$231.30
Surgical	62	317	$3,083.83	$81.54	65	406	$3,544.42	$119.79
Mental Health	6	37	$790.75	$2.46	10	85	$858.21	$6.11
Substance Abuse	1	6	$759.77	$0.39	0	0		$0.00
Maternity	1	4	$1,221.30	$0.41	0	0		$0.00
Non Delivery	0	0		$0.00	0	0		$0.00
Neonate/Newborn	1	4	$184.92	$0.06	0	0		$0.00
Medicare CrossOver				$0.00				$0.00
Total				$310.10				$357.21
	Cases		*Unit*	*Paid*	*Cases*		*Unit*	*Paid*
Hospital Outpatient	*Per 1,000*		*Cost*	*PMPM*	*Per 1,000*		*Cost*	*PMPM*
ER	1,343		$360.62	$40.36	1,477		$380.05	$46.77
Surgery	138		$1,783.52	$20.56	140		$2,665.92	$31.04
Radiology				$13.21				$11.73
Pathology				$17.38				$16.63
Other				$26.75				$28.28
Medicare CrossOver				$0.05				$0.00
Total				$118.31				$134.45
		Util.	*Unit*	*Paid*		*Util.*	*Unit*	*Paid*
		Per 1,000	*Cost*	*PMPM*		*Per 1,000*	*Cost*	*PMPM*
Physician		99,303	$15.43	$127.71		99,134	$16.82	$138.97
EPSDT		8	$0.00	$0.00		4	$0.00	$0.00
Nursing Home		121	$681.59	$6.87		22	$522.65	$0.96
Adult Day Health		1,557	$45.34	$5.88		1,776	$46.40	$6.87
Other Practitioner		3,095	$12.78	$3.30		3,725	$10.42	$3.23
Drug (net Rebate)		88,822	$45.03	$333.29		94,229	$42.84	$336.38
DME		242,566	$1.14	$23.05		311,971	$1.17	$30.45
Ambulance		6,345	$10.92	$5.77		7,262	$12.59	$7.62
Oxygen		5,919	$69.30	$34.18		7,008	$60.75	$35.48
Other Vendors		0		$0.00		138	$1.19	$0.01
Hearing Aid		9	$319.45	$0.24		11	$325.87	$0.29
Dental		0		$0.00		0		$0.00
Vision		667	$13.99	$0.78		679	$14.58	$0.82
Total PMPM				$969.47				$1,052.74
PMPM for Claims over $150K				-$2.15				-$11.93
Net Total PMPM				$967.32				$1,040.81
Trend				9.34%				
Trended PMPM				$1,057.63				

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Appendix A-2
Washington Medical Assistance Administration
Diabetes
Cost Model Summary

	Baseline Year (7/01-6/02)				Program Year 1 (7/02-6/03)			
Member Months				62,684				72,239
Hospital Inpatient	*Admits Per 1,000*	*Days Per 1,000*	*Unit Cost*	*Paid PMPM*	*Admits Per 1,000*	*Days Per 1,000*	*Unit Cost*	*Paid PMPM*
Medical	164	601	$1,562.46	$78.25	167	633	$1,684.68	$88.90
Surgical	48	247	$2,645.47	$54.39	51	253	$2,561.99	$54.07
Mental Health	9	65	$841.10	$4.56	7	48	$884.25	$3.56
Substance Abuse	0	1	$1,061.02	$0.12	2	6	$1,910.17	$0.89
Maternity	1	10	$670.18	$0.58	3	12	$982.19	$0.99
Non Delivery	1	7	$690.08	$0.38	3	12	$934.81	$0.95
Neonate/Newborn	1	2	$345.11	$0.06	1	2	$317.36	$0.04
Medicare CrossOver				$0.00				$0.01
Total				$138.33				$149.41
Hospital Outpatient	*Cases Per 1,000*		*Unit Cost*	*Paid PMPM*	*Cases Per 1,000*		*Unit Cost*	*Paid PMPM*
ER	1,155		$268.24	$25.81	1,226		$294.57	$30.09
Surgery	141		$1,539.27	$18.13	164		$1,211.47	$16.56
Radiology				$8.89				$9.46
Pathology				$8.35				$9.51
Other				$16.83				$16.00
Medicare CrossOver				$0.02				$0.00
Total				$78.03				$81.63
		Util. Per 1,000	*Unit Cost*	*Paid PMPM*		*Util. Per 1,000*	*Unit Cost*	*Paid PMPM*
Physician		78,483	$15.82	$103.50		81,944	$16.42	$112.13
EPSDT		29	$6.07	$0.01		44	$3.50	$0.01
Nursing Home		82	$319.81	$2.18		131	$63.80	$0.70
Adult Day Health		1,000	$45.54	$3.79		1,420	$46.04	$5.45
Other Practitioner		4,820	$10.42	$4.19		2,931	$14.72	$3.60
Drug (net Rebate)		81,820	$47.19	$321.76		84,770	$46.35	$327.45
DME		137,735	$1.30	$14.97		157,444	$1.38	$18.12
Ambulance		2,972	$12.70	$3.15		3,440	$13.38	$3.84
Oxygen		1,518	$59.78	$7.56		1,451	$57.21	$6.92
Other Vendors		1	$0.00	$0.00		0	$0.00	$0.00
Hearing Aid		13	$282.55	$0.31		12	$247.45	$0.24
Dental		0		$0.00		0		$0.00
Vision		755	$13.76	$0.87		766	$14.38	$0.92
Total				$678.64				$710.41
Claims over $150K				-$0.38				-$5.24
Net Total				$678.27				$705.17
Trend				9.34%				
Trended PMPM				$741.59				

Appendix A-3
Washington Medical Assistance Administration
TANF Asthma
Cost Model Summary

	Baseline Year (4/01-3/02)				Program Year 1 (4/02-3/03)			
Member Months				15,084				16,504
Hospital Inpatient	*Admits Per 1,000*	*Days Per 1,000*	*Unit Cost*	*Paid PMPM*	*Admits Per 1,000*	*Days Per 1,000*	*Unit Cost*	*Paid PMPM*
Medical	61	241	$1,434.12	$28.79	55	160	$1,418.60	$18.89
Surgical	14	37	$3,272.97	$10.09	14	31	$2,975.55	$7.80
Mental Health	4	38	$873.17	$2.77	8	61	$567.88	$2.88
Substance Abuse	0	0		$0.00	1	4	$725.01	$0.22
Maternity	33	90	$1,128.28	$8.49	25	67	$1,093.54	$6.13
Non Delivery	7	34	$634.83	$1.82	6	37	$584.51	$1.80
Neonate/Newborn	25	42	$479.91	$1.68	23	42	$483.37	$1.67
Medicare CrossOver				$0.00				$0.00
Total				$53.64				$39.40
Hospital Outpatient	*Cases Per 1,000*		*Unit Cost*	*Paid PMPM*	*Cases Per 1,000*		*Unit Cost*	*Paid PMPM*
ER	1,175		$174.20	$17.05	1,248		$192.11	$19.98
Surgery	52		$1,492.57	$6.46	64		$1,472.69	$7.81
Radiology				$3.19				$3.12
Pathology				$2.22				$2.42
Other				$3.78				$4.12
Medicare CrossOver				$0.00				$0.00
Total				$32.70				$37.46
		Util. Per 1,000	*Unit Cost*	*Paid PMPM*		*Util. Per 1,000*	*Unit Cost*	*Paid PMPM*
Physician		46,910	$19.98	$78.10		48,231	$20.26	$81.43
EPSDT		787	$23.33	$1.53		781	$22.02	$1.43
Nursing Home		0		$0.00		0		$0.00
Adult Day Health		0		$0.00		0		$0.00
Other Practitioner		1,008	$9.42	$0.79		1,151	$15.29	$1.47
Drug (net Rebate)		20,687	$42.27	$72.87		21,313	$43.53	$77.32
DME		16,373	$1.63	$2.23		12,919	$1.63	$1.75
Ambulance		1,460	$10.59	$1.29		1,540	$10.70	$1.37
Oxygen		561	$23.89	$1.12		741	$21.65	$1.34
Other Vendors		5	$13.60	$0.01		30	$11.90	$0.03
Hearing Aid		2	$228.50	$0.03		2	$179.21	$0.03
Dental		0		$0.00		0		$0.00
Vision		470	$8.94	$0.35		600	$9.07	$0.45
Total				$244.65				$243.49
Claims over $150K				$0.00				$0.00
Net Total				$244.65				$243.49
Trend				9.34%				
Trended PMPM				$267.49				

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Appendix A-4
Washington Medical Assistance Administration
Non-TANF Asthma
Cost Model Summary

	Baseline Year (4/01-3/02)				Program Year 1 (4/02-3/03)			
Member Months				23,366				25,657
	Admits	*Days*	*Unit*	*Paid*	*Admits*	*Days*	*Unit*	*Paid*
Hospital Inpatient	*Per 1,000*	*Per 1,000*	*Cost*	*PMPM*	*Per 1,000*	*Per 1,000*	*Cost*	*PMPM*
Medical	117	440	$1,261.51	$46.21	108	463	$1,523.61	$58.84
Surgical	47	211	$2,578.61	$45.29	46	230	$2,508.08	$48.13
Mental Health	26	192	$830.14	$13.31	29	256	$805.83	$17.21
Substance Abuse	1	4	$735.03	$0.25	1	12	$939.08	$0.92
Maternity	9	30	$869.96	$2.20	9	25	$1,066.62	$2.26
Non Delivery	2	16	$505.07	$0.66	3	12	$816.48	$0.84
Neonate/Newborn	7	15	$387.03	$0.48	6	9	$407.84	$0.30
Medicare CrossOver				$0.00				$0.00
Total				$108.40				$128.50
	Cases		*Unit*	*Paid*	*Cases*		*Unit*	*Paid*
Hospital Outpatient	*Per 1,000*		*Cost*	*PMPM*	*Per 1,000*		*Cost*	*PMPM*
ER	1,822		$201.41	$30.57	1,993		$216.94	$36.03
Surgery	130		$1,628.13	$17.60	137		$1,619.73	$18.49
Radiology				$7.04				$7.19
Pathology				$4.19				$5.61
Other				$13.27				$13.22
Medicare CrossOver				$0.02				$0.01
Total				$72.68				$80.55
		Util.	*Unit*	*Paid*		*Util.*	*Unit*	*Paid*
		Per 1,000	*Cost*	*PMPM*		*Per 1,000*	*Cost*	*PMPM*
Physician		86,259	$14.92	$107.28		121,164	$13.79	$139.28
EPSDT		396	$18.31	$0.60		322	$18.81	$0.50
Nursing Home		1	$1,453.43	$0.12		7	$840.70	$0.52
Adult Day Health		100	$44.46	$0.37		331	$47.33	$1.30
Other Practitioner		9,990	$22.81	$18.99		9,168	$18.46	$14.10
Drug (net Rebate)		53,724	$49.91	$223.45		56,298	$50.24	$235.69
DME		227,930	$1.29	$24.48		221,939	$1.42	$26.20
Ambulance		3,082	$11.88	$3.05		2,806	$13.26	$3.10
Oxygen		10,088	$6.37	$5.36		6,132	$9.79	$5.00
Other Vendors		39	$0.79	$0.00		18	$2.98	$0.00
Hearing Aid		19	$147.09	$0.23		27	$171.61	$0.38
Dental		0		$0.00		0		$0.00
Vision		714	$11.33	$0.67		760	$12.02	$0.76
Total				$565.69				$635.90
Claims over $150K				-$5.32				-$23.42
Net Total				$560.37				$612.48
Trend				9.34%				
Trended PMPM				$612.69				

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Appendix B

Disease Identification Criteria

	Heart Failure	Diabetes	Asthma
Program Identification Criteria	Clients that have one or more claims with one of following ICD 9 codes	Clients that have one or more claims with one of following ICD 9 codes.	Clients with ICD-9 code claim AND 1 Asthma NDC code OR 2 ICD-9 codes claims (on different dates).
Program ICD-9 Codes	398.91 402.01 402.11 402.91 404.01 404.03 404.11 404.13 404.91 404.93 425.5 428.x	250.x 357.2 362.0 362.01 362.02 366.41	493.x (excluding 493.2)

Appendix C

Exclusion Criteria

1) Transplant Patients – based on SAS code from McKesson.
    - If diagnosis code in ('V420', 'V421', 'V424', 'V426', 'V427', 'V4281', 'V4282', 'V4283', 'V4289','V429','9968').
    - If Procedure Code in ('33935', '33945', '92997', '92998', '50340', '50365', '50370', '50380', '50300', '50301', '50302', '50303', '50304', '50305', '50306', '50307', '50308', '50309', '50310', '50311', '50312', '50313', '50314', '50315', '50316', '50317', '50318', '50319', '50320', '47135', '47136', '38230', '38231', '38240', '38241', '00580', '32851', '32854', '32852', '32851', '48160', '48550', '48554', '48556', '54680')

2) ESRD Patients – based on SAS code from McKesson.
    - If first three digits of diagnosis code in ('584', '585', '586', '403')

3) HIV Patients – based on contract.
    - If first three digits of diagnosis code in ('042', '279', 'V08')

4) Schizophrenia Patients – based on contract.
    - If first three digits of diagnosis code equal to ‘295’

5) Cancer Patients – based on contract.
    - If first three digits of diagnosis code greater than or equal to '140' and less than or equal to '208' or if the first three digits of the diagnosis code is equal to '230'

6) SNF Patients – based on SAS code from McKesson.
    - If more than 30 days in a SNF; where SNF is defined as services where the place of service is defined by the codes (‘7’, ‘8’) or the category of service is in (‘90’, ‘91’, ‘92’, ‘93’, ‘94’, ‘95’, ‘96’)

7) Congenital Heart Disease Patients – based on SAS code from McKesson.
    - If procedure code in ('93303', '93304', '93315', '93316', '93317', '93530')

8) COPD Patients – based on SAS code from McKesson
    - If first three digits of diagnosis code in ('491', '492', '494', '495', '496') or one of the following diagnosis codes in ('4932', '49320', '49321', '49322')

9) Trauma – based on SAS code from McKesson
    - If first three digits of diagnosis code in (800 – 829, 860 – 897, 925 – 957)

STATE OF WASHINGTON
MEDICAL ASSISTANCE ADMINISTRATION
RENAISSANCE DISEASE MANAGEMENT SAVINGS
EVALUATION PROGRAM YEAR ONE

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March 29, 2005

A MILLIMAN GLOBAL FIRM

Milliman

Consultants and Actuaries

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SECTION I

SUMMARY OF RESULTS

Program Overview

The Renaissance disease management (DM) program for Washington Medicaid clients consists of two disease specific programs – end stage renal disease (ESRD) and chronic kidney disease (CKD). Management of ESRD clients began April 1, 2002. It is our understanding that during the first year of the program there were no participants in the CKD program. Through a variety of educational activities and client interventions, the programs are intended to improve the quality and efficiency of the care provided to eligible Medicaid clients.

Purpose of this Analysis

As part of the contractual agreement between the Washington Medical Assistance Administration (MAA) and Renaissance, minimum savings in excess of program fees have been guaranteed by Renaissance. MAA has requested that Milliman quantify the savings for the first year of the disease management program relative to the savings guarantee.

General Methodology

Our approach to quantification of the program savings is to summarize the per member per month (PMPM) costs of the disease specific cohorts before and after program implementation. In this case, per member refers to each ESRD client, not each client eligible for disease management. Baseline PMPM costs are computed for calendar year 2001. These costs are trended forward to the first program year as a benchmark, or a theoretical estimate of program year expenditures in the absence of the DM program. Program year PMPM costs are then compared to this benchmark to determine gross savings. Program fees are subtracted to derive net savings, which are then compared to the savings guarantee. While relatively simple in concept, numerous assumptions and methodological decisions are required to perform this computation, many of which could have a material impact on the results.

Results

Our comparison of benchmark costs to actual program costs yields the following results:

- ESRD gross savings of $629.58 PMPM.

Program fees per ESRD client per month are subtracted from these gross savings amounts to determine net savings for the program:

- ESRD program costs of $300.00 PMPM.
- Net savings of $329.58 PMPM ($629.58 - $300.00).

The net savings amount is greater than the savings guarantee savings guarantee of $300 PMPM.

The difference ($29.58) represents the amount the program saved per member per month beyond the savings guarantee.

Comments on Findings

We note the following issues that impact the savings calculations:

- We have relied on the identification of clients in the baseline and program years as identified by Renaissance. An alternative approach to client identification, such as a claim data-driven disease screen, would likely yield different results.

- As is typically the case with Medicaid eligibility, retroactive changes can impact the cost effectiveness of the program. For example, clients may be properly identified by the Renaissance disease screen, enrolled in the DM program and actively managed, only to later be retroactively removed from eligibility. In this situation, the potential DM savings for this client are eliminated from the calculations.

- The source and methodology for developing the trend assumptions used to convert the baseline PMPM costs to benchmark PMPM costs has a significant impact on the projected savings. The trend assumptions used in this model are detailed later in this report.

- Our understanding is that Renaissance provides assistance in qualifying clients for Medicare eligibility. Savings realized by the State for accelerated Medicare enrollment have not been included in this analysis.

Caveats

Milliman has relied on data and information provided by MAA and Renaissance to perform the savings calculations presented in this report. While we have performed extensive reasonableness checks of the data, we have not performed an independent audit. Inaccuracies in the underlying data could distort the study results.

It is important to note that this savings calculation is intended to be consistent with the contractual provisions agreed to by MAA and Renaissance. As such, this report should not be used outside this context as a broader assessment of program value or as an assessment of DM programs in general.

The information contained in this report has been prepared for MAA and their consultants and advisors. It is our understanding that the information contained in this report may be utilized in a public document. To the extent that the information contained in this report is provided to third parties, the report should be distributed in its entirety. Any user of the data must possess a certain level of expertise in actuarial science and healthcare modeling, so as not to misinterpret the data presented.

Milliman makes no representations or warranties regarding the contents of this report to third parties. Likewise, third parties are instructed that they are to place no reliance upon this report prepared for MAA by Milliman that would result in the creation of any duty or liability under any theory of law by Milliman or its employees to third parties. Other parties receiving this report must rely upon their own experts in drawing conclusions about the MAA DM program.

SECTION II

METHODOLOGY

The method used to quantify savings was set forth in the contract between Renaissance and MAA. We have compared the costs of the diseased population for the first year of the program to a control population in a year prior to launch of the DM program (baseline year). Adjustments made to either the program year data or baseline year data are documented below. In addition, methods for identifying eligible diseased members for the study are also described.

The program year is 4/1/02 through 3/31/03 and the baseline year is calendar year (CY) 2001 for ESRD. Data for the analysis of both program and baseline years included run-out claims through September of 2004.

Medicaid Programs Excluded From Disease Management

The following classes of Medicaid members were not eligible for DM and were excluded from our analysis:

- Members who are also eligible for Medicare
- Institutionalized members
- Medically indigent members
- Alcohol Drug Abuse Treatment and Support Act (ADATSA) members
- Foster Care/Adoption members
- Refugees
- Those categorized as Pregnant Women (S Women)
- Medically Needy
- State-funded Children
- Take Charge Family Planning members
- Children's Health Insurance Program (CHIP) members
- Specified Low-Income Medicare Beneficiary (SLMB) members

- Expanded Specified Low-Income Medicare Beneficiary (SLMB) members
- Cervical/Breast Cancer Demonstration Project members
- General Assistance Unemployable (GAU) members
- Person Meeting Qualified Disabled Working Individual (QDWI) criteria only, not CN/MN
- Family Medical Reinstatement for Temporary Assistance to Needy Families (TANF) members
- Categorically Needy Pregnant Women – income greater than CNIL; not more than 185% of FPL and Temporary Assistance to Needy Families (TANF) members
- Disabled Non SSI members

Note that these exclusions are applied on a monthly basis. If a member changes aid categories midyear, their disease management eligibility status can change.

Disease Identification Process

The basis of our analysis is the comparison of two populations: a control population and one that has been subjected to DM. Theoretically, if DM is the only differentiating factor between the two populations, the utilization and cost differences between these two populations can be attributed to DM. It was predetermined that the control population to be used in this comparison is the DM eligible population in the state of Washington in a year prior to DM implementation.

Due to the difficulty in identifying the population eligible for this program, we have relied on members identified by Renaissance for both the program and baseline years. They have described their process as follows:

> *Our most recent experience has shown that the best method to identify ESRD patients is by looking for the presence of specific CPT and/or revenue codes. We focused on those patients that had a CPT code of* 90918 *through* 90999 *(nephrologist supervision of dialysis) OR a revenue code of* 821/831/841/851 *(dialysis service) with a service date sometime between* 1/1/01 *and* 12/31/01. *All members triggering one of these codes were considered potential ESRD patients.*
>
> *We performed a detailed claims review on this group of potential ESRD members to determine if these patients were ESRD and, if so, for which months of the baseline period.*

In order to determine ESRD costs per patient per month (PPPM) we first performed a review of the claims data for the members in the potential ESRD patient group. For this group, the claims were sorted in date sequence by patient for the January 2001 to December 2001 time period and a manual review was performed. The manual review focused on identifying the period of time the patient was on dialysis (i.e. was ESRD), if any. This was done by looking at which CPT and/or revenue codes had paid claim amounts in each service month. The intent of the claims review is to match the baseline inclusion and exclusion criteria to the actual program inclusion and exclusion criteria. This obviously gives the best comparison, and thus the best indication of the financial impact of the renal disease management program.

Some patients dialyzed for the entire one-year period, some started dialysis during the period, and some terminated dialysis during the period. For patients that started dialysis after the 1st of a month the entire month was counted. Patients that terminated dialysis part way through a month are counted for the entire month (except for transplants as noted below). For any month that a patient was on dialysis the costs were totaled for that month. For example, if a patient dialyzed for the entire one-year period and his/her paid claims cost was $120,000, then the monthly ESRD cost for this patient was determined to be $10,000.

An unknown amount of costs appeared to be missing from the paid claims data. Dialysis services and nephrology supervision of dialysis are claims that are very systematic and should both be present every month for an ESRD patient. These missing claims are likely attributable to claims that are in the payment process or denied claims. Additional discussion on these "missing" claims is warranted. It is our position that some level of claims will be missing from both the baseline period data as well as the contract period data. Unless information is available to the contrary, we assume this to be a "wash".

Comments on the analysis:

- *Transplant events are excluded from the baseline costs. For example, if a patient transplanted on 12/10/01, their costs for December would be excluded. Their costs through the end of the month prior to the transplant would be included.*

- *We eliminated members if they underwent acute dialysis in conjunction with a hospitalization. The month of ESRD Start was set at the month in which a member had their first outpatient dialysis treatment.*

It is our understanding that this process mimics that used during the program year. We performed an analysis of patients in the program and baseline years who, based on the criteria above, were considered potential ESRD patients, but were not included in the study. We did not find any anomalies suggesting a bias in members selected for the study. Therefore, we

have relied upon the members and ESRD time segments from the Renaissance study. The only exception to this is that we only included months and claims dollars where the member, based on recent eligibility information, should have been eligible for disease management. As stated above, retroactive changes in eligibility are not uncommon and some of these changes affected ESRD patients. The most common change was Medicare eligibility.

Trend Calculation

In order to construct a trend rate for this program, we used the change in monthly claims costs between the baseline and program years for the eligible population determined to not have one of the managed diseases or other select high-cost diseases which are likely to skew results. As part of our analysis of the McKesson disease management programs for CHF, diabetes and asthma, we calculated an annual trend rate of 9.34%. This same trend rate was relied upon in this analysis for Renaissance for all services other than dialysis. We realize that on a service by service basis the 9.34% rate is not accurate, but it was mutually agreed between the DM vendors and MAA to use a single average trend rate for all non-dialysis services.

We used the following process to compute the trend rates for dialysis related services. The count of members receiving services at a kidney center and the average kidney center claims were accumulated on a monthly basis from the beginning of the baseline year to the end of the first program year. The average cost per kidney center patient per month was computed for the baseline period and the contract period (excluding Renaissance enrolled clients). The resulting change in the average monthly cost per patient between the two periods was -4.23% (change covers a period of 1.25 years). This adjustment reflects all changes in the average cost per patient, including the fee schedule reduction effective September 1, 2002 and the large cost increase in dialysis related drugs during the program year.

A similar computation was performed for Other Dialysis Claims that resulted in a -2.91% trend rate from the baseline period to the program period (1.25 years).

It should be noted that a more detailed analysis of the trend for drugs associated with dialysis treatment was not feasible due to inconsistencies in the coding of the units provided.

Savings Guarantee

The original intent of the savings guarantee was to ensure a 100% return on investment (ROI) with respect to the $300 per member per month program fee paid by the State. Based on early data analysis performed by Renaissance this $300 figure was estimated as 5% of monthly claims cost. It has since been discovered that there were errors in this original analysis. With better data, we realize that 5% over states the intended guarantee. Therefore at the direction of MAA, we have used $300 as a fixed savings guarantee to be consistent with the original intent.

SECTION III

Washington Medical Assistance Administration
Renaissance End Stage Renal Disease Savings Calculation*
Cost Model Summary

	Baseline Year (1/01-12/01)						Program Year 1 (4/02-3/03)			
Member Months						1,466				894
Hospital Inpatient	*Admits Per 1,000*	*Days Per 1,000*	*Unit Cost*	*Paid PMPM*	*Trend Rate*	*Trended (1) Paid PMPM*	*Admits Per 1,000*	*Days Per 1,000*	*Unit Cost*	*Paid PMPM*
Medical	1,229	5,640	$1,845.15	$867.19	9.34%	$969.55 (2)	1,034	5,020	$1,662.91	$695.67
Surgical	450	2,366	$2,453.62	$483.69	9.34%	$540.79	483	4,966	$2,217.15	$917.61
Mental Health	98	1,834	$911.86	$139.33	9.34%	$155.78	40	362	$1,332.77	$40.25
Substance Abuse	8	33	$1,248.77	$3.41	9.34%	$3.81	0	0		$0.00
Total	1,785	9,872	$1,815.63	$1,493.63		$1,669.92	1,557	10,349	$1,918.38	$1,654.44
Hospital Outpatient	*Cases Per 1,000*		*Unit Cost*	*Paid PMPM*	*Trend Rate*	*Trended Paid PMPM*	*Cases Per 1,000*		*Unit Cost*	*Paid PMPM*
ER	1,752		$374.77	$54.71	9.34%	$61.16	3,114		$402.29	$104.40
Surgery	1,408		$2,173.05	$254.96	9.34%	$285.05	1,463		$1,744.32	$212.67
Radiology				$23.99	9.34%	$26.82				$27.46
Pathology				$28.95	9.34%	$32.36				$29.83
Kidney Center Claims				$5,329.96	-4.23%	$5,104.44 (3)				$4,801.46
Other Dialysis Claims				$801.10	-2.91%	$777.75 (4)				$613.09
Other				$86.86	9.34%	$97.12				$68.19
Medicare Crossover				$1.88	9.34%	$2.10				$15.43
Total				$6,582.40		$6,386.81				$5,872.54
	Util. Per 1,000		*Unit Cost*	*Paid PMPM*	*Trend Rate*	*Trended Paid PMPM*	*Util. Per 1,000*		*Unit Cost*	*Paid PMPM*
Physician	564,769		$9.90	$465.86	9.34%	$520.85	407,537		$13.88	$471.40
Nursing Home	4,166		$520.68	$180.78	9.34%	$202.12	3,087		$577.05	$148.46
Other Practitioner	1,334		$9.76	$1.08	9.34%	$1.21	349		$22.24	$0.65
Drug	78,933		$47.50	$312.47	9.34%	$349.35	89,087		$44.05	$327.06
DME	514,879		$1.05	$44.96	9.34%	$50.27	570,993		$1.54	$73.17
Ambulance	112,895		$5.58	$52.47	9.34%	$58.67	48,832		$13.31	$54.18
Oxygen	237		$94.12	$1.86	9.34%	$2.08	1,248		$105.25	$10.95
Hearing Aid	0			$0.00	9.34%	$0.00	27		$229.94	$0.51
Dental	2,628		$43.75	$9.58	9.34%	$10.71	2,376		$47.52	$9.41
Vision	630		$12.70	$0.67	9.34%	$0.75	376		$12.28	$0.38
	1,280,472		$10.03	$1,069.74		$1,196.00	1,123,913		$11.70	$1,096.17
Total Monthly Claims Costs				$9,145.76		$9,252.73 (5)				$8,623.15 (6)
Calculated Monthly Gross Savings										$629.58 (7)
Monthly Program Costs										-$300.00 (8)
Net Monthly Per Member Savings										$329.58 (9)
Savings Guarantee										-$300.00 (10)
Net Monthly Per Member Savings in Excess of Savings Guarantee										$29.58 (11)

(1) Trend rate for non-dialysis services based on calculated rate from McKesson study for non-diseased population.
(2) Trended at rate indicated (1) for 1.25 years.
(3) Trend rate is based on kidney center trends including fee schedule change for all dialysis claims. Note that while the 9.34% medical trend rate is an annual trend rate, this trend rate accounts for the full 1 1/4 year period between the center date of the baseline and the program years.
(4) Trend rate is based on dialysis claims at locations other than kidney centers. Note that while the 9.34% medical trend rate is an annual trend rate, this trend rate accounts for the full 1 1/4 year period between the center date of the baseline and the program years.
(5) Trended monthly claims cost during program year.
(6) Unadjusted total program year monthly costs. Note that during the program year there are two patients with large inpatient claims (over $100,000). These claims have not been truncated. The base year does not have outliers of this magnitude.
(7) = (5) -(6)
(8) ESRD monthly program fee.
(9) = (7) + (8)
(10) Savings guarantee is based 100% ROI.
(11) = (9) + (10)

***** This savings computation has been prepared as prescribed by contractual terms and intent between MAA and Renaissance, and does not represent an independent assessment of savings and ROI by Milliman.